Lesson Summary:
In this four-part lesson, students manipulate tag board pieces cut into one-inch, one-foot, and one-yard lengths to discover relationships among the measurement units. They describe the tag board units and identify classroom items which are about the same length in the classroom. Classroom discourse throughout the lesson focuses on students sharing their individual and small group observations and recording their descriptions and comparisons of the units on the “What I Know About Measurement” wall chart. At the conclusion, they write a letter to their parents explaining to them what they learned about the relationship of inches, feet, and yards.

Estimated Duration: Three hours over three days

Commentary:
In this lesson, students compare and describe the relationships among measurement units: i.e., an inch is smaller than a foot and a yard, (a cup is smaller than a gallon, a meter is larger than a centimeter, etc.). Therefore, focus students’ attention on the relationships (For example: 12 inches in a foot and 3 feet in a yard) and measuring with the unit tools created in the lesson. Once students develop a deep understanding of the units they are able to identify the appropriate or best unit to measure various things.

Pre-Assessment:
Use Attachment A, Measurement Anticipation Guide, to assess students’ understanding of the relationships among inches, feet, and yards. The chart consists of several statements that the teacher reads to the students. Students mark whether they agree or disagree with the statements on the left side of the statement. Use columns to the right side of the statements as a formative or post-assessment.

- Read each statement aloud. In the boxes to the left of the statements, students mark an “X” in the “A” column if they agree with the statement or in the “D” column if they disagree with the statement. If they do not know, then no mark is needed. Encourage students not to guess and that it is ok to not know answers at this time.
- Discussion of the chart occurs at the end of the lesson. Collect the handout and save it for the post-assessment.
Scoring Guidelines:
After students have completed the pre-assessment, review their papers individually. Determine which students show evidence of understanding relationships between the units and those which do not.

Answer Key:
1. disagree
2. agree
3. disagree
4. disagree
5. agree

Post-Assessment:
At the completion of the lesson, return Attachment A, Agree / Disagree Chart Pre- and Post-Assessment to the students.

- Read each statement aloud. On the lines to the right of the statement the children check “A” if they agree with the statement or “D” if they disagree with the statement. Have students write corrected statements for those with which they disagree.
- Use the handout to assess individual understanding of the indicator and to determine whether additional instruction is necessary for some or all of the students. The assessment can also be used for discussion. Have students discuss their responses and see if their knowledge changed because of the lesson.

Scoring Guidelines:
After students have completed the post-assessment, review their papers individually. If some students’ responses have not improved from the pre-assessment, provide additional intervention on measurement relationships. Refer to the activities in the Differentiated Instructional Support and Extension sections of this lesson for appropriate intervention activities.

Instructional Procedures:
Part One
Instructional Tips:
- Prepare the chart below for use with the class. During the introduction, cover the lower half of the chart with another sheet of paper so that only the What I Know about Measurement section is visible.
- Use regular paper if tag board is not available to make the measurement unit tools.

<table>
<thead>
<tr>
<th>What I Know about Measurement</th>
</tr>
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<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What I learned about</th>
<th>What I learned about</th>
<th>What I learned about</th>
</tr>
</thead>
</table>
Relationships Among Units of Measure – Grade Two

1. Display a variety of measuring tools for measuring length such as a ruler, tape measure, yardstick, and carpenter's retractable tape measure. Ask questions similar to the following questions.
   - What are these tools? (Students name the items listed above and the teacher writes the words on the board.)
   - What is done with these tools?
   - Describe times you measured things. How have some of you used these tools? (Helped parents measure carpet, measured wood in parents’ workshop, measured my height.)
   - What tool did you use? Was it easy? How did you know what to do?
   - In what kind of jobs is measurement important? (Measurement is important for carpenters, scientists, architects, plumbers, seamstresses, sports referees and custodians.)

2. Record students' comments on chart paper What I Know about Measurement. As the lesson unfolds, continue adding students' observations and remarks to the list on the chart. Display the chart in the classroom as a reference.

3. Give students re-sealable plastic bags containing twelve tag board pieces cut into one-inch by one-inch squares or use Square Inch Models, Attachment B. Ask students what they know about an inch. Tell students that the sides of the square tiles in their bags are one-inch long.

4. Encourage the students to look in their desks or around the room to predict and identify things that are close to one inch. (They might even find one-inch referents with their own body parts such as the span of 3 fingers equals one inch or the distance from the fingertip to the first joint equals one inch - review of measurement indicator two.) They can place the one-inch square beside the item to check for size. Give the students, Attachment B, Things That Are About…and say to the students:
   - You have predicted things that you think are about one inch. Let’s investigate! Use your one-inch squares to actually measure things in our room.
   - Your chart paper has a column for inch, a column for foot and a column for yard. Find things in the room that are one inch and write words or draw pictures under the word, “inch” in the chart. Do not write in the foot or yard column.

5. After children have finished measuring with the one-inch squares, and share the items they found that were about one inch.

6. Extend the activity to find items larger and smaller than an inch or items about four or six inches in length. Encourage students to place the tiles next to the item to determine how long the item is in inches. Observe students as they measure using the square tiles. Assist students who do not align the tiles side-by-side and from one end of the item to the other end when measuring.

7. Have students discuss what they learned about inches with a partner. After partners discuss, refer students to the What I Know about Measurement chart and tell them to share what they learned about inches. Record the student responses in the first column of the chart.

Part Two

8. Introduce a new measurement unit to the students.
   a. Give each student a one-foot piece of tag board or construction paper. Ask students to describe the unit and compare it to the inch unit.
      - Which unit is bigger?
• What is the name of this unit?
• How many inches make a foot? How can we find out? Allow students to use the inch squares to find how many are in a foot.

b. Observe students as they determine the number of inches in a foot and the methods used to measure the foot-long tag board. Some students may mark the inches on the foot long tag board.

c. Clarify that 12 inches is equal to one foot.

9. Allow students time to use the foot-long piece of tag board to predict and find foot-long items in the classroom. Say to the students:

*You have predicted things that you think are about one foot. Let’s hunt for things that are one foot! Use your one-foot pieces of tag board to actually measure things in our room. Find things in the room that are one foot and write words or draw pictures in the second column of the chart.*

10. Have students share items they found which are about one-foot long with the class. Record the items which are about one foot in length on the chart. Challenge students to find items which are smaller than a foot and larger then a foot. Have students share items smaller and larger than a foot with the class.

11. Ask the students about which unit could be used to measure objects. Encourage students to share their ideas and their reasoning for their choices.

• Which unit would you use to measure a pencil – a foot or an inch? Why?
• Which unit would you use to measure the height of a door? Why
• Which unit would you use to measure the distance from your desk to the door? Why?
• Which unit would you use to measure a folder? Why?

12. Divide students into groups of two or three. Give each group something to measure i.e., width of a door, length of window, width of notebook paper, length of shoe, distance between two desks, distance between chair legs, etc. Instruct students to measure using either the squares or foot-long length of tag board. Tell them to determine the appropriate unit to use for the measurement and to be ready to explain their choices in a group discussion.

13. After students complete the measurements, gather them together for a guided discussion:

• Which unit was best to measure the width of the door, length of the chalkboard, etc.? (Allow each group to share their choices and reasoning.)
• Some items can be measured in either inches or feet. How do you decide which unit to use? (Encourage children to justify their reasoning for choosing one unit over another. Possible responses include, if the object is less than a foot, use inches. If the item is more than a foot, use feet and inches.

14. If necessary demonstrate by laying the foot ruler beside something longer than one foot. Count one foot and write it on the board. Then line up the inch squares to the end of the object. Count the number of inch squares and write on the board, i.e., one foot, five inches.

• What would you do if the object measured longer than two feet? (Lay down the foot ruler, mark the end with your finger, move the ruler to the other side of your finger – where the first ruler ended – and continue until you cannot lay down a full ruler.

• What would you do if you have less than a foot left to measure? (Use the inch squares until you reach the end of the object.)

15. Have the students measure the objects using both units. Observe methods students use to measure and how they describe the measurement. Make notes of students who count the units
collectively no matter the size. For example, one foot and six inches is counted as seven units.

16. At the conclusion of Part Two, display the What I Know about Measurement Chart. Ask students to share the one-foot items they found, and to share what they learned about feet and write their responses in the column labeled, "What I learned about feet."

Part Three
17. Display the What I Know about Measurement chart. Review the students’ responses to inches and feet. Ask them if they would like to change, revise or add anything to the inch and foot columns. Uncover the yard column. Ask students what they know about yards and record their responses in the yard column.

18. Introduce the yard by giving each student a three-foot (one-yard) length of tag board. Ask students to make predictions about how many inches and how many feet in a yard. Tell them to compare it to the inch and foot-length pieces of tag board.

19. Allow students to use the inch and foot pieces of tag board to discover how many inches and feet are in a yard. Discuss what they can measure with each object.

20. Give students the Attachment B, "Things that are about..." handout.
   • Use the yard-long piece of tag board to predict and find yard-long items in the classroom.
   • In the third column of your chart, write or draw pictures of the things you found that are about one yard.

21. After they have discovered several items, ask students to share the one-yard items they found.

22. Divide students into groups of two or three. Give each group something to measure i.e., width of a door, length of window, width of a book, length of a pace, distance between three desks, distance between chair legs, etc.

23. Return the one-inch and one-foot lengths of tag board to the students. Tell them to determine the appropriate unit to use of measurement for their items and to be ready to explain their choices in a group discussion.

24. After students complete measurements, gather them together for a guided discussion:
   • Which unit was best to measure the width of the door, length of the chalkboard, etc.? (Allow each group to share their choices and reasoning.)
   • Some items can be measured in either feet or yards. How do you decide which unit to use? (Encourage children to justify their reasoning for choosing one unit over another. Possible responses include if the object is less than a yard, use feet. If the item is more than a yard, use yards, feet, and inches.)

25. Continue the discussion and if necessary model or ask students to model how to measure items more of less than one yard. (Refer to step 13.)

26. At the conclusion of the lesson, gather students together and record what they learned about yards in the third column of the What I Know about Measurement chart.

Part Four
27. Display the What I Know about Measurement chart. Pair the students.
28. Introduce students to the ruler and the yardstick by returning the tag board pieces representing inches, feet and yards to them and by giving each pair of students a ruler and a yardstick.

29. With their partners, have students observe the tools and find the inches and the foot markings on the tools. Allow them time to explore the tools (placing rulers end to end along the length of the yardstick, comparing tag board yard, foot, and inch pieces to the actual tools, etc.)

30. Use the *What I Know about Measurement* chart and encourage students to share their discoveries with the class. Record their observations in the appropriate columns on the chart. Examples:
   - Inches are small units of measure. They are smaller than feet and yards.
   - Yards are larger units of measure.
   - Feet are medium units of measure.
   - Use inches to measure small objects.
   - Yards are more practical to measure very large or long things.
   - Use feet to measure things that would take too long to measure in inches but that are smaller than yards.
   - Twelve inches make a foot.
   - Thirty-six inches make a yard

31. To conclude the lesson, remove the chart paper from the wall. Ask students to reflect about what they learned by writing a letter (or drawing pictures) to tell their parents what they learned about measurement.

**Differentiated Instructional Support:**
Instruction is differentiated according to learner needs, to help all learners either meet the intent of the specified indicator(s) or, if the indicator is already met, to advance beyond the specified indicator(s).

- Students showing evidence of not meeting expectations need additional opportunities to measure materials. Set up a center with measuring tools and materials students can measure (boxes of many sizes, lengths of yarn or rope, connecting cubes, etc.) Reinforce relationships among the units and have students identify which unit is best or more appropriate to measure given objects or distances.
- Use Attachment D, *Working with Inches*, to provide more practice with inches.
- Share with students that if they know the standard length of their own foot, arm-span, hand-span or stride, they can estimate distances or dimensions using their own body parts. Encourage students to measure their own dimensions (foot length, stride, etc.). Then allow them to measure a variety of dimensions and distances in the school or outdoors.
- Let students measure the length width and height of boxes. Under the lid, write the correct dimensions. Students can self check their measurements by looking under the lid.)
- Set out different colored lengths of yarn, rope, string or colored strips of paper. Pre-measure each length and record the measurements in a color-coded table on the inside of a manila folder. Students measure the yarn and record their measurements. They open the folder to check their answers.
- Pairs of students create varying lengths of connecting cubes. Each student connects cubes into a desired length, measures the length, and records the measurement on paper. Students
trade the lengths of connecting cubes, measure, and record the lengths. They then compare answers. If the measurements are different, students re-measure the cubes again. If measurements continue to differ, they ask a third party such as another student or the teacher to verify the measurement.

- Challenge students to find objects in the classroom that are four feet or two yards long. Have them create lists of things that fall into the assigned measurement categories in columns on chart paper.
- Allow students to make their own rulers and yardsticks from tag board. Students can include the half-inch markings as well as the inch markings. Encourage them to measure items with their created measuring tools.
- Have students attempt more complex measurement activities. Provide students with paper that has a four-column chart on it. Have them find objects of various lengths in the classroom and measure them in inches, feet, and yards. Challenge students to record all measurements to the nearest inch (i.e., two feet and three inches; three yards, two feet, and five inches).

<table>
<thead>
<tr>
<th>Objects in class</th>
<th>Inches</th>
<th>Feet</th>
<th>Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door</td>
<td>76 inches</td>
<td>6 feet, 4 inches</td>
<td>2 yards, 4 inches</td>
</tr>
<tr>
<td>Window</td>
<td>105 inches</td>
<td>8 feet, 9 inches</td>
<td>2 yards, 2 feet, 9 inches</td>
</tr>
</tbody>
</table>

**Extensions:**
Ask students to think of all the possible tools they could use for measuring width, height and length. Record their ideas on the board. Bring in or ask volunteers to bring in examples of the measuring tools (rulers, yardsticks, meter sticks, carpenter's metal tape measure, fabric tape measures use in sewing, drafting rules, etc.). Allow students time to examine the tools and how they would be used to measure dimensions, distances, etc. Challenge students to think of an occupation that might use such measuring tools. Record each suggestion on an index card. During free time or in centers, students match the measuring tools to possible activities or jobs that would require their use.

**Home Connections:**
- Tell students to interview family members about all the ways they use measurement in their daily lives. When students return to school, students share the results of their interviews and display in a bulletin board titled "Measurement in Our Lives."
- Create lists of the measurement tools found in the home.
- Find and measure items in the home that are about one inch, six inches, one foot, one yard, and six feet (2 yards). Students make lists of these items and bring them back to school to share with classmates. Write the name of the items the students found on wall charts with the measurements written as headings at the top of the paper.
- Ask students to write about places they have traveled. Find out how many miles they have traveled from place to place. When students return to class, on a U.S. or world map, plot the locations to which students have traveled and record the distance in miles to that location.
Interdisciplinary Connections:
Content Area: Science
Standard: Scientific Inquiry
Benchmark: B. Design and conduct a simple investigation to explore a question.
Indicator: 7. Use appropriate tools and simple equipment/instruments to safely gather scientific data (e.g., magnifiers, non-breakable thermometers, timers, balances and calculators and other appropriate tools.)
Indicator: 8. Measure properties of objects using tools such as rulers, balances and thermometers.
Benchmark: C. Gather and communicate information from careful observations and simple investigation through a variety of methods.
Indicator: 9. Use whole numbers to order, count, identify, measure and describe things and experiences.

Materials and Resources:
The inclusion of a specific resource in any lesson formulated by the Ohio Department of Education should not be interpreted as an endorsement of that particular resource, or any of its contents, by the Ohio Department of Education. The Ohio Department of Education does not endorse any particular resource. The Web addresses listed are for a given site’s main page, therefore, it may be necessary to search within that site to find the specific information required for a given lesson. Please note that information published on the Internet changes over time, therefore the links provided may no longer contain the specific information related to a given lesson. Teachers are advised to preview all sites before using them with students.

For the teacher: variety of measuring tools such as rulers, yard sticks, seamstress tape measures, carpenter’s tape measure and items to measure such as paper clips, pencils, erasers, coins, transparency marker

For the student: re-sealable bag with 12 one-inch squares of tag board; one strip of tag board cut twelve inches by one inch (to represent one foot); one strip of tag board cut thirty-six inches by one-inch (to represent a yard)

Vocabulary:
• inch
• estimate
• foot/feet
• unit
• width
• yard
• yard stick

Technology Connections:
• Students use calculators to add or multiply measurements they collect in the activity.
• Ask students if they have observed the odometer as they ride in a car. Have they seen the numbers change? Challenge students to research how an odometer works.
• Ask the high school science teachers to allow students to observe their classes on days that they use graphing calculators, palm pilots, flasks, beakers, test tubes, etc.

Research Connections:

Attachments:
Attachment A, Agree / Disagree Chart Pre- and Post-Assessment
Attachment B, Square Inch Models
Attachment C, Things That Are About…
Attachment D, Working with Inches
### Measurement Anticipation Guide

Name_____________________________   Date__________________________

**Directions:** Read each statement below. If you agree with the statement, put an X in the A column. If you disagree with the statement, put an X in the D column.

<table>
<thead>
<tr>
<th></th>
<th>Before we studied measurement</th>
<th>After we studied measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A foot is larger than a yard.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>An inch is smaller than a foot.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>A yard is larger than an inch.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>There are 12 feet in one inch.</td>
<td></td>
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<tr>
<td>5.</td>
<td>The larger the unit of measure, the smaller the number of units needed.</td>
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</tbody>
</table>
## Attachment B

Square Inch Models

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</tbody>
</table>
1. Use your measuring tool to find things in the room that are about one inch, one foot, and one yard.
2. Write the name of the object or draw a picture of the items in the correct column for each measurement.

<table>
<thead>
<tr>
<th>INCH</th>
<th>FOOT</th>
<th>YARD</th>
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<tbody>
<tr>
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</tbody>
</table>
Directions:
1. The ruler above is blank. Predict how many squares you can place on top of the ruler?

2. Put squares end-to-end on top of your ruler. How many squares did you use?

3. Look at each object. Predict how many squares long. Write your prediction in the middle column.

4. Measure the objects with squares. Write the number of squares in the last column.

<table>
<thead>
<tr>
<th></th>
<th>PREDICTION</th>
<th>NEAREST INCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper clip</td>
<td></td>
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<tr>
<td>Pencil</td>
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<td>Eraser</td>
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<tr>
<td>Coins</td>
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<tr>
<td>Width of Paper</td>
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<tr>
<td>Length of Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose your own object</td>
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</tr>
<tr>
<td>Choose your own object</td>
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</tbody>
</table>