Grade Level	Content Area	Course Title *(For 9-12 Samples Only)*	Unit Title
Grade 4	Science		A Liter Bit Of This And An Ounce Of That

Length of Unit	Time of Year Taught	Expected Prior Knowledge
7 class sessions	Fall	Linear Measurement

Unit Description The student will understand and apply the appropriate units and procedures to measure weight and capacity.

Standards: Arizona **Strand:**1 Inquiry Process **Concept** 2 Scientific Testing **PO 4.** Measure using appropriate tools (e.g., ruler, scale, balance) and units of measure (i.e., metric, U.S. customary). (See M04-S4C4-03 and M04-S4C4-07)	Skills to be Taught 1. The student will estimate and measure weight using standard units including ounces and pounds. 2. The student will estimate and measure weight using standard units including grams and kilograms. 3. The student will estimate and measure capacity using standard units including cups, pints, quarts, and gallons. 4. The student will estimate and measure capacity using standard units including milliliters and liters.
Summative Assessment *In addition to the description, include a copy of the summative assessment in the application package.*	**CULMINATING ACTIVITY:** Students will choose one of the following activities: A. Bean Babies: 1. Choose an important person from the American Revolution and create a Bean Baby in their image. B. Gallon Man/Woman: 1. Use construction paper, glue and markers to create a large visual of a Gallon Man or Woman to help understand the relationship between cups, pints, quarts, and gallons using Appendix C C. Instant Chocolate Pudding: Appendix D
Scoring for Summative Assessment *In addition to the description, include a copy of the answer key and scoring rubric (if applicable) for the summative assessment in the application package.*	Students' "Culminating Activity" will be scored using rubric. Mastery is set at 80%. Students must receive at least 64 out of 80 possible points to achieve mastery.
Materials/Resources Needed *Include all items for the entire unit.*	Individual baby pictures and birth weight of students; Post It notes; Four or five objects (for each group), one of which weighs a pound with others being close to that weight; Paper/Markers; Four baby scales to measure pounds and ounces; Sentence Strips; Scoops; 5-10 index cards; Pinto beans; Paper Clips; Bulletin board paper; Masking tape; Multicultural crayons; One gallon plastic bag; Markers; White construction paper; Scissors; Tape or glue; Appendix A; Appendix B. For each group of four: Balance scale; 2 plastic cups; 1 set of weights consisting of 25 1-gram pieces, 5 5-gram pieces, 2 10-gram pieces, and 1 20-gram piece; 1 washer; 1 wood square; 1 poker chip; 1 container ½ liter (for water) Five different sized jars (olive jar, baby food jar, pill bottle, etc.), Water, Paper; Pencil. Plastic cup measure; Cup, pint, quart, and gallon containers; Plastic tub; Paper towels; Recording sheet; 2 cups, each containing 50 regular paper clips; 2 cups, each containing 25 jumbo paper clips

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Instruction and Timeline	**Introduction to Weight** The student will understand and apply the appropriate units and procedures to measure weight. *Key Vocabulary* 1. Weight - how heavy something is 2. Ounce - a standard unit of weight equal to 1/16 of a pound 3. Pound - a standard unit of weight equal to 16 ounces Prior to the lesson, each student will be asked to bring in their baby pictures and their birth weights. Students will write their birth weight on a Post It note and display along with baby picture on a bulletin board. Discuss with students their understanding of pound and ounce. Divide students into four groups. Distribute objects to each group. Have students predict by looking and handling the objects to see which weighs closest to a pound.	**Bean Babies** Students will understand and apply the appropriate units and procedures to measure weight. *Key Vocabulary* 1. Weight - how heavy something is 2. Ounce - a standard unit of weight equal to 1/16 of a pound 3. Pound - a standard unit of weight equal to 16 ounces Prior to the lesson the teacher uses sentence strips to draw scales depicting pounds and ounces. Label each ounce. Use index cards to denote pounds. (Appendix A) Make enough scales to represent the birth weights of the students in the class. Choose one student to come to the front of the classroom. Have the student place a one-gallon plastic bag on one of the baby scales. Help the	**Introduction to Grams** Students will understand and apply the appropriate units and procedures to measure weight. *Key Vocabulary* 1. Gram- the standard unit of weight (mass) in the metric system: the weight of 1 cubic centimeter of water 2. Standard- a unit of measure agreed upon and used by everyone Prior to lesson assemble the balance. Prepare the paper clips. Prepare the weight sets. The paper clips and weight sets should be kept out of sight until they are needed. Hold up a washer, a wood square, and a poker chip. Challenge the students to put the objects in order from heaviest to lightest. Divide the students into 4 groups. Ask the Materials Manager to get a washer, a wood square, and a poker chip from the materials station. Let the students place the objects in order. Introduce the Balance. Introduce the units. Tell the	**Introduction to Capacity** The student will understand and apply the appropriate units and procedures to measure capacity. *Key Vocabulary*: 1. Capacity- volume of fluid (such as water) a container can hold when full. Prior to lesson, fill each group's jars with varying amount of liquid. Allow time for each group to share their predictions with the class. Allow time for each group to share their plan with the class. Students will share their description with a partner. *Assessment* 1. Observation of the students and the completion of their	**Cups, Pints, Quarts, and Gallon** The students will understand and apply the appropriate units and procedures to measure capacity. *Key Vocabulary:* 1. Cup- a standard unit of liquid measure (8 fluid ounces) 2. Pint- a standard unit of liquid measure (16 fluid ounces) 3. Quart- a standard unit of liquid measure (32 fluid ounces) 4. Gallon- a standard unit of liquid measure (128 fluid ounces) Discuss liquid measurement. Show different containers used to measure cups, pint, quart, and gallon. How many cups of water does it take to fill the gallon container? *Assessment* 1. Student completion of

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
	Post and share each group's findings on the board. Lecture on early measurement systems using information taken from Britannica On-line. *Assessment* Observation of students and the completion of their predictions along with discussions of their birth weight to objects.	student to fill the bag with beans until it equals the student's birth weight. Seal the plastic bag. Divide students into 4 groups. Have students further analyze the data by determining the least and greatest birth weights in the class. Students display their completed Bean Babies in the classroom. *Assessment* Students will be assessed on their participation in measuring to the nearest pound in creating a Bean Baby and in their construction and interpretation of a bar graph.	students that we want to weigh the three objects using paper clips. Explain weighing in paper clips using the following explanation: Put the object to be weighed in one cup on the balance. Put the paper clips in the other cup until the beam is even or balanced. Count the number of clips that were needed to balance the object. Weigh the objects in paper clips: Teacher will pass out a cup of paper clips to each group, being sure to give half of the groups regular clips and the other half jumbo paper clips. Allow plenty of time for the students to complete their weighing. Discuss the discrepant event. Ask the reporter from each group to report how much their washer weighed in paper clips. Record results on the board and discuss why there is a discrepancy. Ask the materials manager from each group to hold up a sample of paper clips that they used to weigh. The students should realize that because the paper clips are not all the same size, the	predictions. 2. Completion of writing assignment.	the activity and the recording sheet.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
			objects will not weigh the same from group to group. At this point explain the need for an agreed upon standard unit of measure. Introduce the gram. Explain that the standard metric unit of measuring weight is called the gram. Show the students the different gram pieces and identify each one. The Materials Manager from each group goes to the material center and gets a set of gram weights. *Assessment* 1. Students answer the following questions: a. Name the parts of the balance system. b. What makes a gram a good standard unit for weighing things? c. What could be used for a standard unit of weight if we didn't have the gram? d. What other uses can you think of for the balance? e. What experiment could you design that used a balance?		

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Student Activities and Timeline	Students will discuss and compare their birth weights and will answer, "How many _____ do you weigh?" Students from each group will order objects from the least to closest to a pound.	Students measure and place enough beans into a plastic bag to equal their birth weight. With construction paper, crayons and markers, they draw a head, arms, and legs and turn the bags of beans into Bean Babies. As students are making the bean babies, call one student at a time up to the board. Using the post-it-notes from Lesson 1, student places his/her note on correct birth weight. After all of the students have placed the post-it-notes on the graphs, ask the students to determine the number of pounds that most of the children in the class weighed at birth.	Students will place objects in order. Students estimate and weigh the original objects in grams and record the estimation and the actual weight in grams.	Students will observe jars and predict how the five jars can be ordered from the least to the greatest amount of liquid. Students will devise a way to figure out which has the most, the least, and so on using the 2 Cup measures in their investigations. Students will imagine themselves as a container. " Write about yourself and draw a picture of what you look like. What are you made of? What would you hold? Where are you found?"	Students will work in groups using the container marked "Cup" to determine the capacity of the other containers. For example, how many cups of water does it take to fill the pint container? How many cups of water does it take to fill the quart container? Students will record those measures on the recording sheet. Students will select another container and use it to determine the capacity of the other containers. Record. Students will continue selecting other containers until they have found as many ways as you can to fill each of the other containers. Record all solutions on Appendix B.

Individual Activity Rubric

Name _____ Date _____

Chapter Number _____ Activity _____

Directions
Check one box in each row to finish each sentence. Give each check mark the assigned number of points. Add the points in each column. Then, add across the bottom row to find the total score.

POINTS	10	9	8	7	6	
For this activity, (student's name) _____	all of the time	most of the time	half of the time	less than half of the time	none of the time	
Followed directions						
Asked questions when help was needed						
Worked independently when required						
Used appropriate resources and materials						
Completed assigned tasks						
Showed an understanding of the content						
Presented materials without errors						
Explained thinking with support						
_____ _____						
_____ _____						
POINTS	+	+	+	+	=	TOTAL SCORE

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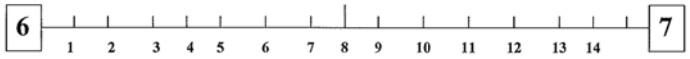
Appendix A

Birth Weight Scale



Adapted from PBS Mathline The Elementary School Math Project "Sand Babies" Math Grows Up (Measurement) http://www.pbs.org/mathline

Students shall receive at least 64 out of 80 points to achieve mastery.

Appendix B

Recording Sheet

Name_____

Date _____

It takes _____ cups to fill a pint.

It takes _____ cups to fill a quart.

It takes _____ cups to fill a gallon.

It takes _____ pints to fill a quart.

It takes _____ pints to fill a gallon.

It takes _____ quarts to fill one half-gallon.

It takes _____ quarts to fill a gallon.

Adapted from Full Option Science System, "Measurement", Lawrence Hall of Science, University of California, Berkley, California 94720

Appendix B Answer Key

It takes 2 cups to fill a pint.
It takes 4 cups to fill a quart.
It takes 16 cups to fill a gallon.

It takes 2 pints to fill a quart.
It takes 8 pints to fill a gallon.

It takes 2 quarts to fill one half-gallon.
It takes 4 quarts to fill a gallon.

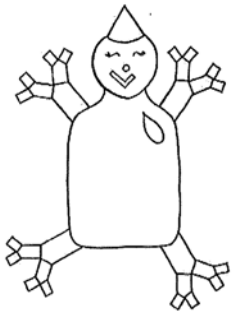
Appendix C

Gallon Man

Students can create their own Gallon Man or Gallon Woman to help them see the relationship between cups, pints, quarts, and the gallon.

Materials needed:
Construction paper – different colors for the face, cups, pints, quarts, and gallon
Scissors
Glue
Markers or crayons

Steps:
1. Cut out shapes for each part of Gallon Man.
2. Label each CUP, PINT, QUART, and GALLON.
3. Assemble Gallon Man and decorate.



A Liter Bit of This…, Grade 4 2001 Conference 12

Appendix D

Instant Chocolate Pudding Mix

Ingredients

- 3 ounces Dutch-processed cocoa, approximately 1 cup
- 2 ounces cornstarch, approximately 1/2 cup
- 6 ounces sugar, approximately 1 1/2 cups
- 1 1/2 ounces instant non-fat dry milk, approximately 1/2 cup
- 1 teaspoon salt

Directions

In a large bowl or plastic container with a lid, combine the cocoa, cornstarch, sugar, instant non-fat dry milk and salt. Store it in an airtight container in the refrigerator.