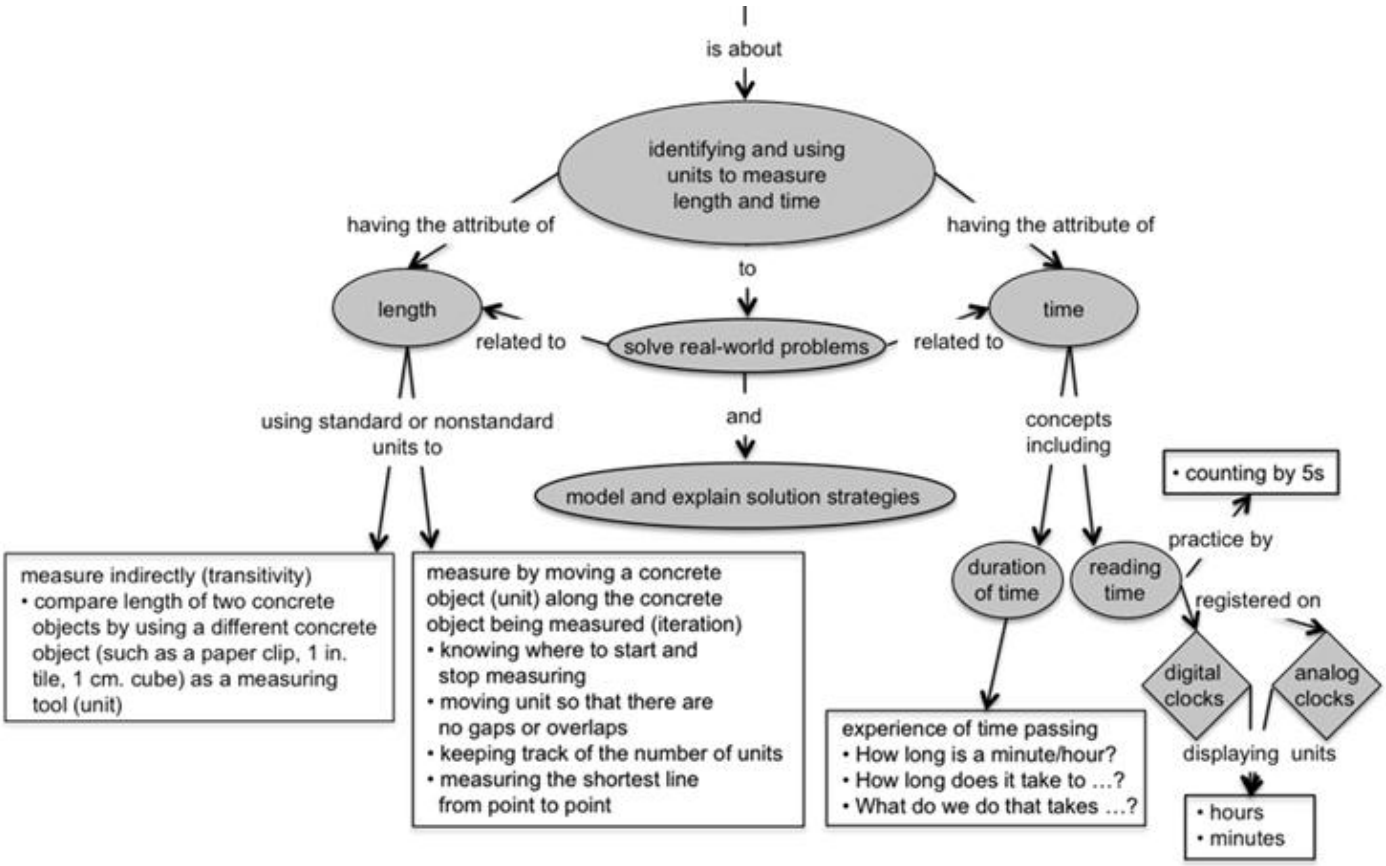
Unit: 3 - Measurement (Length and Time) (Week 12, 4 Weeks)

Common Core Initiative

Overarching Questions and Enduring Understandings

In what ways does measurement help us in our daily lives?

Graphic Organizer



Unit Abstract

The measurement foci of this unit are length and time.
Work with length revolves around measuring indirectly with non-standard units (transitivity[1]) and understanding the concept of measuring with "a unit" (iteration[2]). *Standard units of linear measure (e.g., inch, centimeter, are not mentioned in the Common Core standards and are not part of this unit.*
The first grade Common Core standard for time is limited to reading and writing time as it is displayed on digital and analog clocks, to the hour and half-hour. Because understanding the duration of time is an important concept that is more meaningful to children, but only developed over time, this concept is also addressed in this unit.

[1]transitivity principle: measuring indirectly by comparing the length of two concrete objects by using a

different (third) concrete object as a measuring tool. For example: To determine whether tables in two different rooms are the same length, use a piece of rope (R) to determine the length of Table A, then use the same length of rope to measure the length of Table B. If $T^A = R$ and $T^B = R$, then $T^A = T^B$

[2]unit iteration: using multiple copies of one object (the unit) to measure a larger object. For example, using one linking cube to measure the width of a desk by moving it along the path (width) and counting the units each time the linking cube is moved. An example using a *standard* measurement tool would be using one ruler (the unit) to measure the width of a room.

NOTE:
Limiting measuring to those objects whose span is "a whole number of length units with no gaps or overlaps" (as stated in Standard 2 below) may be counter-productive. If students are freely choosing objects in the classroom to measure, these objects are not all going to have a span that is a whole number of units. Letting students think that objects will always span a whole number of units encourages them to create gaps or overlaps in their measuring in order to come out with a whole number of units. Since measurements are always approximations, a concept we want students to understand, they need to learn that sometimes a measurement is "a little more" or "a little less" than a whole number of units. They need to learn to use those terms until they learn more exact standard units. For these reasons, this unit and the corresponding Highlight Lesson will intentionally include contexts that extend beyond those spanned by a whole number of length units.

Content Expectations/Standards	**Unit Level Standards**
Measurement & Data **1.MD.A**. Measure lengths indirectly and by iterating length units. ▪ **1.MD.A.1.** Order three objects by length; compare the lengths of two objects indirectly by using a third object. ▪ **1.MD.A.2**. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. **1.MD.B.** Tell and write time. ▪ **1.MD.B.3.** Tell and write time in hours and half-hours using analog and digital clocks.	

Essential/Focus Questions	**Key Concepts**
1. How do we measure the length of an object? 2. Why are measurement tools used in finding length? 3. How do we use a clock to measure time? 4. What is the relationship between minutes and hours? 5. What do we need to be thinking about to measure something accurately? 6. How does the knowledge of measuring length and time support	afternoon analog clock digital clock half-hour hour indirect measurement iteration linear measure measurement tools minute

problem solving in the real world?	morning night nonstandard unit standard unit transitivity unit
Assessment Tasks	**Intellectual Processes**
Assessment Overview Assessment Recording Form 12212 Independent Practice student page 12212 Independent Practice cover page 12212 Professional Learning Task –Using Student Work to Explain the Thinking in the Assessment	**(Standards of Mathematical Practice)** **Students will have opportunities to:** ▪ **attend to precision** when measuring length, by moving a unit along the length of the object being measured, with no gaps or overlaps between units, but sometimes ending with a measure "a little more" or "a little less" than a whole unit; ▪ **construct viable arguments and critique the reasoning of others** when explaining the number of nonstandard units required to measure an object; ▪ **model with mathematics** by using a nonstandard unit to model the linear measurement of an object; ▪ **reason abstractly and quantitatively** when making indirect comparisons and explaining the relationship of two objects to a third object; and ▪ **use appropriate tools strategically** when using clocks to identify time.
Lesson Sequence	**Resources**
Lesson Overview Lesson Worksheet - Team Recording Sheet Lesson Worksheet - Explanation with Pictures of Tools Lesson Worksheet -Explanation without Pictures of Tools Lesson Worksheet - How Long? Lesson Worksheet - How Long is a Row of Stars? Professional Learning Task –Using Student Work To Discuss Misunderstandings or Errors Professional Learning Task – Video of Student Thinking of the Lesson	**Instructional, Professional, Other, and Assessment Resources** **Length** http://pbskids.org/dinosaurtrain/games/howbigareyou.html Dinosaur Train Using non-standard units to measure length. The activity develops estimation and measurement skills by estimating how long certain objects are relative to other smaller objects. http://pbskids.org/curiousgeorge/games/how_tall/how_tall.html How Tall? (Curious George) Using non-standard units to measure height. The activity develops estimation and measurement skills by estimating how tall certain objects are relative to other smaller objects. http://www.harcourtschool.com/activity/length_strength4/ Length Strength Students use paper clips to measure other objects

	http://illuminations.nctm.org/LessonDetail.aspx?id=L873 Lesson We're Going on Length Measurement Hunt Students use lengths of yarn to compare to lengths of other items in the class (measure length using a nonstandard unit) http://www.k-5mathteachingresources.com/support-files/measuringwithsticks.pdf Measuring with Sticks http://www.k-5mathteachingresources.com/support-files/measuringshoes.pdf Measuring Shoes http://www.k-5mathteachingresources.com/support-files/measuringwithcubes.pdf Measuring with Connecting Cubes http://www.k-5mathteachingresources.com/support-files/measuringwithcubes.pdf Measuring with Dominoes Step-by-step directions for activities for measuring lengths indirectly (nonstandard units). These would be useful at a "measuring center" where an adult (e.g., a parent, a teaching assistant) is working with students. http://dcsd.k12.nv.us/other/pdc/mathbuilder/mathdict/word/proce/exp_70/ref-1-id-839-eid-870-target-_self.htm Nonstandard Units Student uses paper clips as the unit for measuring a pencil. May be a challenge for students who struggle with fine-motor coordination. http://www.onlinemathlearning.com/kindergarten-measurement.html Sid the Science Kid: Exploring Measurement - YouTube video; (video for kids) Excellent modeling of iteration using nonstandard linear units http://illuminations.nctm.org/LessonDetail.aspx?id=L873 We're Going on a Length Measurement Hunt (Illuminations) Looking in the classroom for objects that are longer than, shorter than, the same size as a piece of yarn http://illuminations.nctm.org/LessonDetail.aspx?id=U187 What Should I Measure Next? How About Me? Students use nonstandard units to measure their heights and arm spans. Two lessons. **Time** http://www.k-5mathteachingresources.com/support-files/timebarriergame.pdf Barrier Time Game

	http://www.k-5mathteachingresources.com/support-files/timebarriergamegrid.pdf Barrier Time Game Grid Partner game that involves writing times on both analog and digital clocks http://nzmaths.co.nz/resource/clock-wise Clock Wise Lessons/activities that support telling time to the hour and the half-hour using analog and digital clock http://www.online-stopwatch.com/full-screen-online-countdown/?ns=../s/10.mp3&nslen=1 Digital timer, Stop-watch http://www.oswego.org/ocsd-web/games/ClassClock/clockres.html Digital demonstration clock. Teacher can move hands by 1, 5, 10, 15, 30 minute or 1 hour intervals as students read the time. http://www.time-for-time.com/swf/myclox.swf Digital demonstration clock. Teacher can move hands by 1, 15, 30 minute or 1 hour intervals as students read the time. Both digital and analog clocks are displayed. Current time can also be displayed. http://www.k-5mathteachingresources.com/support-files/my-favorite-time-of-day.pdf Favorite Time of Day Student selects a time, shows it on analog and digital clocks, draws a picture showing what s/he is doing at this time, and writes why this is her/his favorite time of day. http://www.bbc.co.uk/wales/snapdragon/yesflash/time-1.htm Snapdragon Clock Student uses arrows to move the hands of the clock to the correct time (hour) http://www.abc.net.au/countusin/games/game10.htm Count Us In Time concentration game (hour) http://www.timemonsters.com/ Time Monsters A series of engaging interactive lessons to teach telling time, starting with the meaning of "o'clock." http://www.crickweb.co.uk/assets/resources/index.php?&file=Toolkit%20index2a Twelve-Hour Clock Another analog/digital teaching clock. Hands can be moved forward or backward in 5, 15, 30 minute or 1 hour

	intervals. Clock can be set to display only minute hand, only hour hand or both hands. http://www.hbschool.com/activity/telling_time_gr1/ Telling Time Student selects the digital time (multiple choice) displayed on the analog clock (hour and half-hour) **Measurement in General** http://www.psteacherresources.com/index.php?main_page=product_info&cPath=1_29&products_id=55 Download 98 measurement vocabulary cards (3 cards per page) to use on a math word wall, choosing those that match your instruction. (minimal cost) **Books, Poems, Songs** **Length** Fowler, Richard. (1993) Ladybug on the Move. Houghton Mifflin Harcourt A ladybug searches for a resting place, moving from under a stone, into a flower pot, across the garden shed, etc. A simple story as a starting point for investigating length, e.g., the length of the ladybug's path. Ling, Bettina. The Fattest, Tallest, Biggest Snowman Ever. New York: Scholastic, 1997. A child makes a snowman and measures it with a paper-clip chain. Lionni, Leo. Inch By Inch. 1995. HarperCollins Suggestion: Have students use paper clips to represent the length of an inchworm. Put 10 paper clips and the book in a center. The children may go to the center and use the paper clip inch worms to guess and then measure the lengths of various items on varies pages of the book and then various items in the center or in the classroom. Nathan, Cheryl, and Lisa McCourt. The Long and Short of It. Bridgewater Books, 1998. Long and short features of several animals are illustrated, with comparisons made to common objects. For example, the tail of a ring-tailed lemur is longer than a skateboard. Pluckrose, Henry. Length. (1995) Chicago: Children's Press Twinn, Michael. Ten Beads Tall. (2002). Child's Play International An interactive book. It comes with ten beads on a string. Students measure the items/pictures in the book with the beads. **Time** Brown, Marc. Arthur's Teacher Trouble. Canada: Little, Brown & Co., 1986

	Carle, Eric. The Grouchy Ladybug. HarperCollins, 1996 This classic story explores the concepts of time, size and manners through the exploits of a very grouchy ladybug. When it refuses to share aphids with another ladybug, the grouchy insect flies off to pick a fight an hour with a succession of ever-larger animals. Harper, Dan. Telling Time with Big Mama Cat. HMH Books, 1998 Busy Big Mama Cat has activities every hour and sometimes more often than that. Harris, Trudy. The Clock Struck One. Millbrook Pr Trade, 2009 An expansion of Hickory-Dickory-Dock, with the cat chasing the mouse through the hours of the day. Clocks on every page follow the race. Heling, Kathryn. Midnight Fright. Scholastic, 2008 The book contains a clock whose hands can be moved to match the times in the story.(hour) Lewis, Paul Owen. P Bears New Years Party. Tricycle Press, 1999. On New Year's Eve, P Bear awaits the arrival of his friends. Hour-by-hour, they arrive. Murphy, Stuart J. It's About Time! HarperCollins, 2005 The story follows a child as he goes through a typical day, with activities listed for each hour. Times are presented on both a digital and analog clock. Pluckrose, Henry. Time. Children's Press, 1995 A very simple introduction to the concepts of time. Sierra, Judy, What Time Is It Mr. Crocodile? First Voyager Books, Harcourt. 2004 Telling time to the hour as Mr. Crocodile makes his daily schedule **Professional Resources** **Atlas** http://oaklandk12.rubiconatlas.org/c/pi/v.php/Atlas/Authentication/View/Login?lrr=2& The Oakland Schools site for accessing the unit overview, lesson, assessment, and resources for this unit. **Books** Baratta-Lorton, Mary, Bob Baratta-Lorton, and Cynthia Garland-Dore. (2010). *Mathematics Their Way Summary Newsletter*. CA. Center for Innovation in Education. http://www.center.edu/NEWSLETTER/newsletter.shtml Chapter 7, Measurement Van de Walle, John A., Karp, Karen M., Bay-Williams, Jennifer M. (2009). *Elementary and Middle School*

	Mathematics: Teaching Developmentally, Seventh Edition. Massachusetts. Allyn and Bacon Publishers. **Professional Journals** Dietiker, Leslie C., Funda Gonulates, and John P. Smith III. (2011). Understanding Linear Measurement. *Teaching Children Mathematics*, 18(4), 252. Virginia. NCTM Publications. Retrieved January, 2012, from http://www.nctm.org/publications/article.aspx?id=31414 Enhancing linear measurement tasks to afford better opportunities to develop conceptual understanding. Kamii, Constance. (2006) Measurement of Length: How Can We Teach It Better? *Teaching Children Mathematics*, 13(3), 154. Virginia. NCTM Publications. Retrieved January, 2012, from http://www.nctm.org/publications/article.aspx?id=22011 Pace, R.D. (2004). On time with Arthur. *Teaching Children Mathematics*, 10(8), 416-419. Virginia. NCTM Publications. Retrieved January, 2012, from http://www.nctm.org/publications/article.aspx?id=21508 Using literature (*Arthur's Teacher Troubles*, Brown 1986) to teach concepts of time, e.g., sequences of events. Thompson, Tony D. and Ronald V. Preston (2004) Measurement in the Middle Grades: Insights from NAEP and TIMSS. *Teaching Mathematics in the Middle Schools*, 9(9), 514. Virginia. NCTM Publications. Retrieved January, 2012, from http://www.nctm.org/publications/article.aspx?id=20255 Tyminski, Andrew M., Monica Weilbacher, Nicole Lenburg, Cindy Brown. 2008). Ladybug Lengths: Beginning Measurement. *Teaching Children Mathematics*, 15(1), 34. Virginia. NCTM Publications. Retrieved January, 2012, from http://www.nctm.org/publications/article.aspx?id=22224 A sequence of lessons designed to help students develop an understanding of iteration, a fundamental measurement concept. Unit Resources

<< Previous Year

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