Grade 3 - Module 9 - Time, Mass and Volume

Recommended Time Frame - 15 Days

NATIONAL TRAINING NETWORK

2016-2017

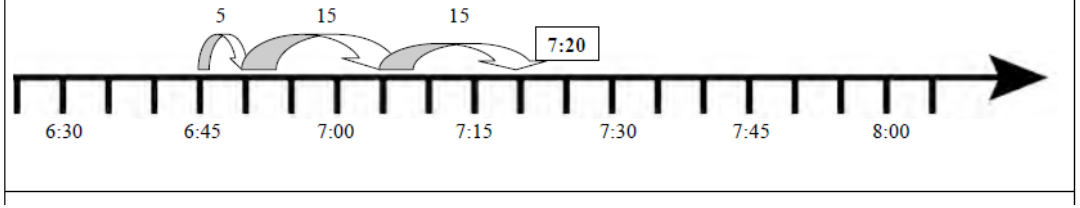
Big Idea
Measurement involves the comparison of a quantity to a unit with the same attribute (weight, capacity, etc.)
Vocabulary
gram, kilogram, milliliter, liter, mass, volume, equation, unknown value, division, multiplication, groups, items, total items
Prior Learning
In Grade 2 students estimated and solved measurement word problems involving length.
Essential Questions
• What are the different units of measurement you can use to classify the capacity, weight and mass of an object? • What tools can you use to measure the liquid volume and mass of an object? • How are precision and estimation related when we measure? • How can I compare a gram and a kilogram? milliliters and liters?
Competencies
• Students will estimate and measure liquid volume and mass in metric units. • Students will solve one-step word problems with mass or volume, in the same units, using addition, subtraction, multiplication or division. • Students will tell and write time, measure time intervals, and solve word problems with addition and subtraction of time. • Students will estimate liquid volume or mass of objects using grams, milliliters or liters.
Misconceptions
• Students may incorrectly read the mark on a scale when measuring liquid volume or mass. • Students may incorrectly compute when solving word-problems with measurement including time across the hour.
Resources from The Key Elements to Mathematics Success - KEMS Level C for Building the Conceptual Understanding of this Module

LESSON 19 – TIME INTERVALS IN MINUTES
Additional Activities: Quiz – T557—T558; Time Intervals in Minutes– Scavenger Hunt T982-T983
To access the online teacher lesson notes, a video clip, and the student homework go to:
http://ntnmath.com/new/pages/grade3/TimeIntervalsinMinutes.php
Link to Slideshow

LESSON 20 - MEASURE AND ESTIMATE MASS OF OBJECTS AND LIQUID VOLUME
Additional Activities: Quiz – T587—T588; Measure and Estimate Mass of Objects and Liquid Volume– Chain Reaction
T984 To access the online teacher lesson notes, a video clip, and the student homework go to:
http://ntnmath.com/new/pages/grade3/MeasureandEstimateMassofObjectsandLiquidVolume.php
Link to Slideshow

LESSON 21 - VOLUME AND MASS WITH WORD PROBLEMS
Additional Activities: Quiz – T614—T615; Volume and Mass with Word Problems– Chain Reaction T985-T986
To access the online teacher lesson notes, a video clip, and the student homework go to:
http://ntnmath.com/new/pages/grade3/VolumeandMasswithWordProblems.php
Link to Slideshow

Additional Manipulatives/Tools/Resources to Enhance the Module
Junior Architects: Getting to know the shapes. In this lesson, students develop strategies identifying two-dimensional shapes. http://illuminations.nctm.org/LessonDetail.aspx?ID=L650 Found Pounds In this lesson, students will create memorable benchmarks for ounces and pounds by playing a classroom scavenger hunt game in which they gain points for finding objects that weigh approximately an ounce or pound. Students will practice weighing objects and will discuss why it is important to know the difference between ounces and pounds. (a kitchen scale is needed) http://illuminations.nctm.org/LessonDetail.aspx?id=L863 Ideas and Food - Students use a nonstandard cup or plastic drinking container, the minimum amount of fruit drink needed to serve class members (Students need to do research at a grocery store unless lesson is adapted.). http://illuminations.nctm.org/LessonDetail.aspx?ID=L193 Rectangles and Parallelograms - While exploring properties of rectangles and parallelograms using dynamic software, students identify, compare, and analyze attributes of both shapes through physical and mental manipulation. http://illuminations.nctm.org/LessonDetail.aspx?id=L350

CCSS-Mathematics Content Standards	Examples
3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.	Students will solve mathematical and real-world problems with elapsed time. Students could use clock models or number lines to solve. On the number line, students should be given the opportunities to determine the intervals and size of jumps on their number line. Students can use pre-determined number lines (intervals every 5 or 15 minutes) or open number lines (intervals determined by students). Example: Tonya wakes up at 6:45 a.m. It takes her 5 minutes to shower, 15 minutes to get dressed, and 15 minutes to eat breakfast. What time will she be ready for school? 
3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Excludes compound units such as cm^3 and finding the geometric volume of a container. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems, i.e., problems involving notions of "times as much";	This standard asks for students to reason about the units of mass and liquid volume. Students need multiple opportunities weighing classroom objects and filling containers to help them develop a basic understanding of the size and weight of a liter, a gram, and a kilogram. Milliliters may also be used to show amounts that are less than a liter. Word problems should only be one-step and include the same units. Example 1: Students identify 5 things that weigh about one gram. They record their findings with words and pictures. (Students can repeat this for 5 grams and 10 grams.) This activity helps develop gram benchmarks. One large paperclip weighs about one gram. A box of large paperclips (100 clips) weighs about 100 grams so 10 boxes would weigh one kilogram. Example 2: A paper clip weighs about a) a gram b) 10 grams c) 100 grams? Foundational understandings to help with measure concepts: • Understand that larger units can be subdivided into equivalent units (partition). • Understand that the same unit can be repeated to determine the measure (iteration). • Understand the relationship between the size of a unit and the number of units needed (compensatory principal).

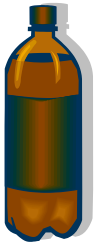
Works Referenced in the Development of the Module	
Common Core State Standards Initiative http://www.corestandards.org/	North Carolina Mathematics Wiki http://maccss.ncdpi.wikispaces.net/
Illustrative Mathematics Project http://illustrativemathematics.org	PARCC http://parcconline.org/
Mathematics Assessment Project http://map.mathshell.org.uk/materials/index.php	Smarter Balanced Assessment Consortium http://www.smarterbalanced.org/
Ohio Department of Education http://education.ohio.gov/GD/Templates/Pages/ODE/ODEPrimary.aspx?page=2&TopicRelationID=1704	Utah Education Network http://www.uen.org/commoncore/
NOYCE Foundation: http://www.insidemathematics.org/	

Suggested Pacing for Grade 3 Module 7 – 15 Days	
***Teacher Note: Please read the Commentary section for the Illustrative Math Tasks for recommended use of the task within the Module. Some tasks will be instructional, requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.**	
Day 1	**Introduce Module 9: Time, Mass and Volume** **KEMS Lesson 19: Time Intervals in Minutes** **Concept Recall**: Module 9 - Day 1 **Warm-Up**: Counting by 5's and Telling Time on S176(T540) **Homework Review:** Review homework from the previous day **Modeling**: Introduce Essential Questions on T530 Model the S Step for SOLVE on S177(T542) **Guided Discovery**: Reviewing Time – Concrete on S177(T542) Teacher directions on T531 **Concept Check**: Module 9 - Day 1 **Homework**: SOLVE: Hailey leaves school at 3:25. She gets to her piano lessons 5 minutes later. What time does she get to her lesson? **Additional**: Words for Word Wall: **clock, intervals**
Day 2	**KEMS Lesson 19: Time Intervals in Minutes** **Concept Recall**: Module 9 - Day 2 **Warm-Up**: Carly has homework in three subjects: math, science and reading. She spends 20 minutes reading, 15 minutes on her science and 20 minutes on her math homework. How many minutes did she spend on her homework? **Homework Review:** Review Homework from Day 1 **Modeling**: Review Essential Questions on T530 **Guided Discovery**: Telling Time – Pictorial on S178(T544) Teacher directions on T532-T533 **Independent Practice:** Telling Time – Pictorial on S178(T544) Problems 3 and 4 **Concept Check**: Module 9 - Day 2 **Homework**: **SOLVE:** Karen is making a scrap book of her family's summer vacation. It takes Karen 35 minutes to make a scrap book page. She started working on one page at 12:10 PM. What time will she finish making one page? **Additional**: Words for Word Wall: **digital clock, analog clock, minutes**
Day 3	**KEMS Lesson 19: Time Intervals in Minutes** **Concept Recall**: Module 9 - Day 3 **Warm-Up**: Mary leaves home at 6:45 a.m. and arrives at school at 7:21 a.m., how long did it take her to get to school? Use a model to explain your answer. **Homework Review:** Review Homework from Day 2

	Modeling: Review Essential Questions on T530 **Guided Discovery**: Time to the Nearest Minute on S179-S180(T546, T548) Teacher directions on T533-T535 **Independent Practice:** Time to the Nearest Minute on S180(T548) Problems 3 and 4 **Concept Check**: Module 9 - Day 3 **Homework**: Nick's karate class starts at 6:30 pm and ends at 7:20. How long is his karate class? **Additional**: SOLVE Problems for SOLVE Activity 1. We walked to the school library. We left at 11 o'clock. We returned to the classroom 25 minutes later. What time did we get back? 2. We have a 15 minute recess in the morning. It begins at 11:00. When is recess over? 3. I took the attendance sheet to the office. I left the classroom at 9:30. I was back in the classroom 10 minutes later. What time is it? 4. Today we have P.E. class at 2:00. It lasts 30 minutes. What time does the class finish? 5. Fifty minutes past 2 o'clock is 2:50. 55 minutes past 2 o'clock is 2:55. What time is 60 minutes past 2 o'clock. Divide students into 5 groups. Write the SOLVE Problem in each group on a large sheet of poster paper. Have the students complete the S Step and then pass their poster on to the next group. The second group should check the S Step and then complete the O Step. Continue with this process until each group has their original SOLVE poster back. After checking the steps, offer students an opportunity to present their problem.
Day 4	**KEMS Lesson 19: Time Intervals in Minutes** **Concept Recall**: Module 9 - Day 4 **Warm-Up**: Abby had a 20 minute lunch. Lunch ended at 12:37. What time did lunch start? **Homework Review:** Review Homework from Day 3 **Modeling**: Review Essential Questions on T530 **Guided Discovery**: Time to the Nearest Minute – Digital Clock on S181(T550) Teacher directions on T535-T536 **Independent Practice:** Time to the Nearest Minute – Digital Clock on S181(T550) Problem 3 **Guided Discovery**: Time to the Nearest Minute – Abstract on S182(T552) Teacher directions on T536-T538 **Independent Practice:** Time to the Nearest Minute – Abstract on S182(T552) Problems 4 - 6 **Concept Check**: Module 9 - Day 4 **Homework**: S185 (T556) **Additional**: Task: TV Time (3.MD.A.1) **Part 1: (Whole Group)** As a class, create a list of people/places that use schedules on a regular basis. Talk about why time to the minute and elapsed time are important. Try these activities to build understanding of time to the minute and elapsed time. Discuss to clarify misunderstandings and misconceptions.

<table>
<tr><td></td><td>What strategies can you use to help you figure out time to the minute?
Ask students to figure out the time to the minute for various analog clock faces.
Using a clock, have students show a selected time while thinking aloud.
How is figuring out elapsed time like giving back change or counting? What strategies do you use? Show with pictures, numbers, and words.
What time is three hours and thirty minutes before 12:36? Four hours after?
Part 2: (Whole Group)
In small groups, solve this problem. Use pictures, numbers, models and words to prove your thinking. When you are finished, compare your findings with other groups.
Make a list of your favorite TV shows and the length of time of each. If you watched all of these shows in one week, how much time did you spend watching TV? Share your findings with another group.
Part 3: (Partners)
Look at your classroom clock. Create a number line from 1 to 12. Use your number line to help fill in the schedule below for Hollywood Cinemas 12.
<table>
<tr><td>Movie</td><td>Start Time</td><td>End Time</td><td>Duration</td></tr>
<tr><td>Alvin and the Chipmunks</td><td>12:15</td><td></td><td>1 hour, 10 minutes</td></tr>
<tr><td>Harry Potter</td><td>2:34</td><td>4:34</td><td></td></tr>
<tr><td>Ice Age</td><td>4:30</td><td></td><td>90 minutes</td></tr>
<tr><td>The Muppets</td><td></td><td>7:20</td><td>1 hour, 20 minutes</td></tr>
<tr><td>Smurfs</td><td>7:30</td><td>8:47</td><td></td></tr>
</table>
</td></tr>
<tr><td>Day 5</td><td>KEMS Lesson 19: Time Intervals in Minutes
Concept Recall: Module 9 - Day 5
Warm-Up: Robert had to drive 3 hours and 20 minutes. He started driving at 11:00 AM. What time did he finish driving?
Homework Review: Review Homework from Day 4
Modeling: Review Essential Questions on T538
Model the SOLVE Problem on S183(T554)
Independent Practice: Scavenger Hunt on T982-T983
Concept Check: Module 9 - Day 5
Homework: If Time Permits on S184(T555)
Additional: Quiz on T557-T558
(Teacher note: Extensions can include time related to fractions – ½ of an hour is 30 minutes; converting time from minutes to minutes and hours – 90 minutes is $1\frac{1}{2}$ hours; elapsed time beyond an hour.)</td></tr>
<tr><td>Day 6</td><td>KEMS Lesson 20: Measure and Estimate Mass of Objects and Liquid Volume</td></tr>
</table>

	Concept Recall: Module 9 - Day 6 **Warm-Up**: Multiplying by 10 on S186(T570) **Homework Review:** Review Homework from Day 5 **Modeling**: Introduce Essential Questions on T559 Model the S Step for SOLVE on S187(T572) **Guided Discovery**: Working with Mass Using Grams and Kilograms – Concrete on S187(T572) Teacher directions on T560-T562 **Concept Check**: Module 9 - Day 6 **Homework**: Make a list of 3 items that can be measured using grams and 3 items that can be measured using kilograms. **Additional**: Words for Word Wall: **mass, gram, kilogram**
Day 7	**KEMS Lesson 20: Measure and Estimate Mass of Objects and Liquid Volume** **Concept Recall**: Module 9 - Day 7 **Warm-Up**: Choose an item in the classroom that would be measured using kilograms. Explain your thinking. **Homework Review:** Review Homework from Day 6 **Modeling**: Review the Essential Questions on T559 **Guided Discovery**: Working with Mass Using Grams and Kilograms – Pictorial on S188(T574) Teacher directions on T562-T563 **Independent Practice:** Working with Mass Using Grams and Kilograms – Pictorial on S188(T574) Problems 3, 4, 7 and 8 **Guided Discovery**: Working with Mass Using Grams and Kilograms – Pictorial to Abstract on S189(T576) Teacher directions on T564 **Independent Practice:** Working with Mass Using Grams and Kilograms – Pictorial to Abstract on S189(T576) Problems 3 - 5 **Concept Check**: Module 9 – Day 7 **Homework**: SOLVE: A loaf of bread weighs about 700 grams. About how much will 4 loaves of bread weigh in grams?
Day 8	**KEMS Lesson 20: Measure and Estimate Mass of Objects and Liquid Volume** **Concept Recall**: Module 9 – Day 8 **Warm-Up**: Choose 3 items in your classroom that you would measure in grams. Write the items in a list from least to greatest mass. **Homework Review:** Review Homework from Day 7 **Modeling**: Review the Essential Questions on T559 **Guided Discovery**: Working with Volume using Milliliters and Liters – Concrete on S190(T578) Teacher directions on T565-T566 **Concept Check**: Module 9 - Day 8 **Homework**: SOLVE: Jenny is helping her mom make punch for a party. The recipe they have needs 2 liters of juice. If they are making 6 batches of punch, how many liters of juice will they need? **Additional**: Words for Word Wall: **milliliter, liter, volume**
Day 9	**KEMS Lesson 20: Measure and Estimate Mass of Objects and Liquid Volume**

	Concept Recall: Module 9 - Day 9 **Warm-Up**: Make a list of 3 items that are measured in liters. **Homework Review:** Review Homework from Day 8 **Modeling**: Review the Essential Questions on T559 **Guided Discovery**: Working with Volume using Milliliters and Liters – Pictorial on S191(T580) Teacher directions on T566-T568 **Independent Practice:** Working with Volume using Milliliters and Liters – Pictorial on S191(T580) Problems 3, 4, 7 and 8 **Guided Discovery**: Working with Volume using Milliliters and Liters – Pictorial to Abstract on S192(T582) Teacher directions on T568-T569 **Independent Practice:** Working with Volume using Milliliters and Liters – Pictorial to Abstract on S192(T582) Problems 3-5 **Concept Check**: Module 9 - Day 9 **Homework**: S195(T586) **Additional**: Liters or Milliliters Activity **Liters and Milliliters** A liter (L) and a milliliter (mL) are two units for measuring capacity in the metric system. This bottle holds 1 liter of water. A milliliter is about 20 drops of water.   1. Mr. Franklin filled a bucket with water to clean his floor. Does his bucket probably hold 9 liters or 9 milliliters of water? _____ 2. A baker adds half of a teaspoon of vanilla to her cake recipe. Did she use 2.5 L or 2.5 mL of vanilla? _____ 3. Chris bought a cup of hot chocolate. Does his cup probably hold 400 liters or 400 milliliters of hot chocolate? _____ 4. Kaylee bought juice for her friends to drink at her birthday party. Did she probably buy 5 L of juice or 5 mL? _____ 5. Miss Marge has a large fish tank in her office. Does her fish tank hold 100 liters or 100 mL of water? _____
Day 10	**KEMS Lesson 20: Measure and Estimate Mass of Objects and Liquid Volume**

	Concept Recall: Module 9 - Day 10 **Warm-Up**: There are 350 milliliters of water in the container for a science experiment. The students use 148 milliliters for the experiment. How many milliliters of water are left in the container? **Homework Review:** Review Homework from Day 9 **Modeling**: Review Essential Questions on T569 Model SOLVE problem on S193(T584) **Independent Practice:** Chain Reaction on T984 **Concept Check**: Module 9 - Day 10 **Homework**: If Time Permits on S194(T585) **Additional**: Quiz on T587-T588 Illustrative Math Task: How heavy? (3.MD.A.2) https://www.illustrativemathematics.org/content-standards/3/MD/A/2/tasks/1929
Day 11	**KEMS Lesson 21: Volume and Mass with Word Problems** **Concept Recall**: Module 9 - Day 11 **Warm-Up**: Working with Multiplication and Division on S196(T601) **Homework Review:** Review Homework from Day 10 **Modeling**: Introduce Essential Questions on T589 **Guided Discovery**: SOLVE Problem – Volume word Problem – Finding a Quotient – Concrete on S197(T603) Teacher directions on T590-T591 **Concept Check**: Module 9 - Day 11 **Homework**: SOLVE: There are two bags of flour on the shelf. Each bag weighs 7 kilograms. What is the total weight of the two bags of flour? **Additional**: Words for Word Wall: **unknown value, total items, items, division, groups**
Day 12	**KEMS Lesson 21: Volume and Mass with Word Problems** **Concept Recall**: Module 9 - Day 12 **Warm-Up**: There are 81 paper clips in a cup. Each paper clip has a mass of approximately 1 gram. If the paper clips are evenly divided into groups of 9 grams, how many paper clips will be in each group? **Homework Review:** Review Homework from Day 11 **Modeling**: Review the Essential Questions from T589 **Guided Discovery**: SOLVE Problem – Volume Word Problem – Finding a Quotient – Pictorial on S197(T603) Teacher directions on T592 **Guided Discovery**: SOLVE Problem – Volume Word Problem – Finding a Quotient – Abstract on S197(T603) Teacher directions on

	T593-T594 **Concept Check**: Module 9 - Day 12 **Homework**: SOLVE: Jenny has a container with that holds 2 liters of water. She fills the container 8 times to water the garden. How much water did she pour on the garden? **Additional**: Words for Word Wall: **equation**
Day 13	**KEMS Lesson 21: Volume and Mass with Word Problems** **Concept Recall**: Module 9 - Day 13 **Warm-Up**: Choose three objects from your desk or book bag. Estimate the total mass of the three items. **Homework Review:** Review Homework from Day 12 **Modeling**: Review the Essential Questions from T589 **Guided Discovery**: SOLVE Problem – Mass Word Problem – Finding a Product – Concrete on S198(T605) Teacher directions on T594-T595 **Guided Discovery**: SOLVE Problem – Mass Word Problem – Finding a Product – Pictorial on S198(T605) Teacher directions on T595-T596 **Guided Discovery**: SOLVE Problem – Mass Word Problem – Finding a Product – Abstract on S198(T605) Teacher directions on T597-T598 **Concept Check**: Module 9 - Day 13 **Homework**: SOLVE: Hillary has two book bags. She takes one bag on the days she has art club because it has her art supplies. Book Bag 1 weighs 12 kilograms and Book Bag 2 weighs 16 kilograms. What is the total weight of the two book bags? **Additional**: Words for Word Wall: **multiplication**
Day 14	**KEMS Lesson 21: Volume and Mass with Word Problems** **Concept Recall**: Module 9 - Day 14 **Warm-Up**: Write a SOLVE problem with mass or volume that your partner can use the SOLVE method with. **Homework Review:** Review Homework from Day 13 **Modeling**: Review the Essential Questions from T589 **Guided Discovery**: SOLVE – Volume and Mass Word Problems – Using an Equation on S199(T607) Teacher directions on T598-T600 **Independent Practice:** SOLVE Problems on S200-S201 (T609, T611) **Concept Check**: Module 9 - Day 14 **Homework**: S203(T613)
Day 15	**KEMS Lesson 21: Volume and Mass with Word Problems** **Concept Recall**: Module 9 - Day 15 **Warm-Up**: Exchange SOLVE problems from Day 14 with your partner and complete the steps of SOLVE

	Homework Review: Review Homework from Day 14 **Modeling**: Discuss the Essential Questions on T600 **Independent Practice:** Chain Reaction on T985-T986 **Concept Check**: Module 9 - Day 15 **Homework**: If Time Permits on S202(T612) **Additional**: Quiz on T614-T616 Inside Mathematics: Time to Get Clean (3.MD.A.1) http://www.insidemathematics.org/assets/common-core-math-tasks/time%20to%20get%20clean.pdf