Measurement and Geometry
Math in Focus

Unit 4 Curriculum Guide
April 29th, 2019 – End of School Year

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

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Unit 3: Chapters 11, 12, 13, 18
Eureka Module 2
Eureka Module 6
Eureka Module 7

In this Unit Students will

- Find the mass of objects in kilograms or grams and utilize scales to find the mass of objects in compound units
- Measure volume in liters and milliliters and use various measuring cups to measure containers in liters and milliliters
- Draw bar models to solve real-world problems without teacher assistance and interpreting data
- Work with scales in counts of two or greater
- Learn to use line plots to organize data and show frequency of an event
- Understand that bar graphs are used to compare data while line plots show how the data is grouped, compared, and spread
- Classify polygons and are taught names given to special polygons and quadrilaterals

Unit 4 Pacing Guide			
Activity	**NJSLS**	**Day/ Time**	**Notes**
Use the Application Problem in the lesson Eureka: Module 2, Lesson 3- Count by fives and ones on the number line as a strategy to tell time to the nearest minute of the clock	3.MD.A.1	1 block	Video Resource: https://youtu.be/9J0wABp1EIo Sample PARCC Released Questions: #17 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=9 #3 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=3 i-Ready Toolbox Assessment Book Questions: Assessment 1: #3, #25 Assessment 2: #4, #15 Before teaching elapsed time, make sure students can tell time to the minute. Allow students to use a clock with movable hands.
Use the Application Problem in the lesson Eureka: Module 2, Lesson 5- Solve word problems involving time intervals within 1 hour by adding and subtracting on the number line	3.MD.A.1	1 block	Video Resource: https://youtu.be/PWDuMZ7eS_4 Sample PARCC Released Questions: #10 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=7 #13 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=8 #3 https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=4 #12 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-

			2018.pdf#page=10 #5 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_PBA_Item_Set.pdf#page=4 i-Ready Toolbox Assessment Book Questions: Assessment 1: #3, #25 Assessment 2: #4, #15
Anchor Task: Choose a task from the 3.MD.A.2 Folder MIF: Lesson 11.3 Kilograms and Grams (Not the conversions)	3.MD.A.2	1 block	Sample PARCC Released Questions: # 5: https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=6 #36: https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=23
Anchor Task: Choose a task from the 3.MD.A.2 Folder MIF: Lesson 11.4 Liters and Milliliters (Not the conversions)	3.MD.A.2	1 block	Sample PARCC Released Questions: #33 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=23
Anchor Task: Choose a task from the 3.MD.A.2 Folder MIF: Lesson 12.1 Real World Problems: One-Step Problems	3.MD.A.2 3.NBT.2 3.OA.3-7	1 block	Have students provide answers in the same units given in the problems. Do not have them convert the units.
Anchor Task: Choose a task from the 3.MD.A.2 Folder MIF: Lesson 12.2 Real World Problems: Two-Step Problems	3.MD.A.2 3.NBT.2 3.OA.3-7	1 block	Have students provide answers in the same units given in the problems. Do not have them convert the units.
Anchor Task: i-Ready Toolbox Assessment 2 #12 Eureka: Module 2,	3.MD.A.2	1 block	Video Resource: https://youtu.be/XKjH0YEd_VU Sample PARCC Released Questions: # 5:

Lesson 6- Build and decompose a kilogram to reason about the size and weight of 1 kilogram, 100 grams, 10 grams, and 1 gram			https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=6 #36: https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=23
Use the Application Problem in the lesson Eureka: Module 2, Lesson 7- Develop estimation strategies by reasoning about the weight in kilograms of a series of familiar objects to establish mental benchmark measures	3.MD.A.2	1 block	Video Resource: https://youtu.be/tgpb__UpTe8 Sample PARCC Released Questions: # 5: https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=6 #36: https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=23 Students may incorrectly think about size as they determine the estimates for mass. To avoid this common error, allow students to handle and touch all objects before they give an estimate.
Anchor Task: i-Ready Toolbox Assessment 2 # 42 Eureka: Module 2, Lesson 8- Solve one step word problems involving metric weights within 100 and estimate to reason about solutions	3.MD.A.2	1 block	Video Resource: https://youtu.be/NjPpzgbbtKA Sample PARCC Released Questions: #33 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=23 i-Ready Toolbox Assessment Book Questions: Assessment 1: #17
Anchor Task: https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=6 Eureka: Module 2,	3.MD.A.2	1 block	Video Resource: https://youtu.be/jMHT3YTD23w

Lesson 9- Decompose a liter to reason about the size of 1 liter, 100 milliliters, 10 milliliters, and 1 milliliter			
Use the Application Problem in the lesson Eureka: Module 2, Lesson 10- Estimate and measure liquid volume in liters and milliliters using the vertical number line	3.MD.A.2	1 block	Video Resource: https://youtu.be/EoRArPP9Q8E Sample PARCC Released Questions: #4 https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=5
Anchor Task: https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=18 Eureka: Module 2, Lesson 11- Solve mixed word problems involving all four operations with grams, kilograms, liters, and milliliters given in the same units	3.MD.A.2	1 block	Video Resource: https://youtu.be/4UTrRVzKtFA Sample PARCC Released Questions: #20 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=11 #22 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=13
Anchor Task: Choose a task from the 3.MD.B.3 Folder MIF: Lesson 13.1 Making Bar Graphs with Scales	3.MD.B.3	1 block	Sample PARCC Released Questions: #29 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=18 #6 https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=6 #10 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=

			6 Intervals on a bar graph may confuse students. Although intervals are not in single units, students may count each square as one unit.
Anchor Task: Choose a task from the 3.MD.B.3 Folder MIF: Lesson 13.2 Reading and Interpreting Bar Graphs	3.MD.B.3	1 block	Sample PARCC Released Questions: #33 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=20 #29 https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=21 #35 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=22 i-Ready Toolbox Assessment Book Questions: Assessment 1: #14 Assessment 2: #26 Intervals on a bar graph may confuse students. Although intervals are not in single units, students may count each square as one unit.
Anchor Task: Choose a task from the 3.MD.B.4 Folder MIF: Lesson 13.3 Line Plots	3.MD.B.4	1 block	
Use the Application Problem in the lesson Eureka Lesson: Module 6, Lesson 6- Interpret measurement data from various line plots	3.MD.B.4	1 block	Video Resource: https://youtu.be/tks63K2FBao
Use the Application Problem in the lesson Eureka Lesson:	3.MD.B.4	1 block	Video Resource: https://youtu.be/avMngX6UnQE Sample PARCC Released Questions: #36

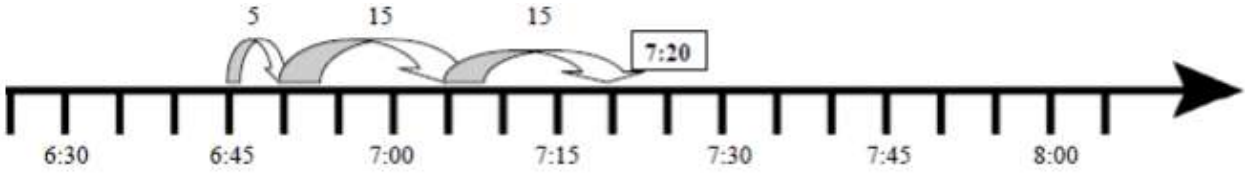
Module 6, Lesson 7- Represent measurement data with line plots			https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=25 #24 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=15 i-Ready Toolbox Assessment Book Questions: Assessment 1: #6, #33 Assessment 2: #7
Use the Application Problem in the lesson Eureka Lesson: Module 6, Lesson 8- Represent measurement data with line plots	3.MD.B.4	1 block	Video Resource: https://youtu.be/aYRkAQuuUFM Sample PARCC Released Questions: #36 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=25 #24 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=15 i-Ready Toolbox Assessment Book Questions: Assessment 1: #6, #33 Assessment 2: #7
Use the Application Problem in the lesson Eureka Lesson: Module 6, Lesson 9- Analyze data to problem solve	3.MD.B.3 3.MD.B.4	1 block	Video Resource: https://youtu.be/vuKRcOm5i9E
Anchor Task: Choose a task from the 3.G.A.1 folder MIF: Lesson 18.1 Classifying Polygons	3.G.A.1	1 block	Some students may not figure out the relationships between shapes. To address this misconception, provide toothpicks or straws to create shapes. To help students visually see the relationship between a rhombus and a square, ask students to change the angles. Have students talk about the relationship they noticed as they moved the angles. As students develop definitions for specific shapes, relationships between the properties will make sense to them.

Use the Application Problem in the lesson Eureka: Module 7, Lesson 4- Compare and classify quadrilaterals	3.G.A.1	1 block	Video Resource: https://youtu.be/U9vqOwGba5A Sample PARCC Released Questions: #26 https://parcc-assessment.org/wp-content/uploads/2018/08/Math_2018_Released_Items/Grade03/Grade-3-Math-Item-Set-2018.pdf#page=19 #24 https://parcc-assessment.org/wp-content/uploads/2018/01/MathReleasedItems/Grade-3-Math-Item-Set-2017.pdf#page=14 i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30
Anchor Task: Choose a task from the 3.G.A.1 folder Eureka: Module 7, Lesson 5- Compare and classify other polygons	3.G.A.1	1 block	Video Resource: https://youtu.be/TLjDGAHawB0 Sample PARCC Released Questions: #1 https://parcc-assessment.org/content/uploads/released_materials/05/Grade_03_Math_Item_Set.pdf#page=2 #31 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=19 i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30
Use the Application Problem in the lesson Eureka: Module 7, Lesson 6- Draw polygons with specified attributes to solve problems	3.G.A.1	1 block	Video Resource: https://youtu.be/CGQ49iaZBb4 Sample PARCC Released Question: #20 https://parcc-assessment.org/content/uploads/released_materials/01/3rd_Grade_Math_EOY_Item_Set.pdf#page=12

			i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30
Anchor Task: Choose a task from the 3.G.A.1 folder Eureka: Module 7, Lesson 7- Reason about composing and decomposing polygons using tetrominoes	3.G.A.1	1 block	Video Resource: https://youtu.be/23bmip91XDA i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30
Anchor Task: Choose a task from the 3.G.A.1 folder Eureka: Module 7, Lesson 8- Create a tangram puzzle and observe relationships among the shapes	3.G.A.1	1 block	Video Resource: https://youtu.be/YOuT6Rd_NGw i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30
Use the Application Problem in the lesson Eureka: Module 7, Lesson 9- Reason about composing and decomposing polygons using tangrams	3.G.A.1	1 block	Video Resource: https://youtu.be/xSkTuBzK1KU i-Ready Toolbox Assessment Book Questions: Assessment 1: #30 Assessment 2: #30

Common Core State Standards	
3.MD.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.

- This standard calls for students to solve problems with elapsed time, including word problems. Students could use clock models or number lines to solve.
- Elapsed time is the time that has passed from one point to another. Finding elapsed time includes knowing the starting and ending time of an event, then determining how much time has passed.
- On the number line, students should be given the opportunities to determine the intervals and size of jumps. Students could use pre-determined number lines (intervals every 5 or 15 minutes) or open number lines (intervals determined by students).



- Students should use the number line as a visual model to solve real world problems involving time. Students should choose appropriate strategies to solve real world problems involving time.
- Model measurement vocabulary: *estimate, time, time intervals, minute, hour, and elapsed time.*

3.MD.2	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

- 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.
- Vocabulary terms: *measure, liquid volume, mass, standard units, metric, gram, kilogram,* and *liter.*
- Word problems should only be one-step ,include the same units, and adding, subtracting, multiplying, or dividing.

Example:

Students identify 5 things that have a mass of about one gram. They record their findings with words and pictures. (Students can repeat this for 5 grams and 10 grams.)

<u>This activity helps develop gram benchmarks:</u>

One large paperclip weighs about one gram.

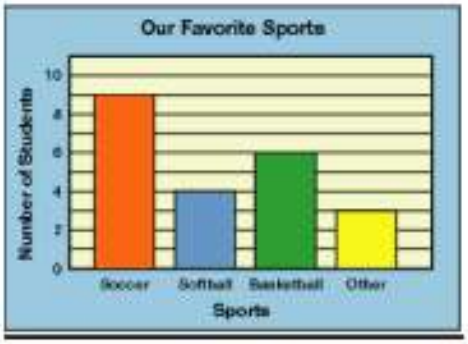
A box of large paperclips (100 clips) has a mass of about 100 grams so 10 boxes would have a mass of one kilogram.

Students must pick up and weigh and fill containers and other classroom objects to help them develop a basic understanding of the size and mass of a liter, a gram, and a kilogram. Milliliters may also be used to show amounts that are less than a liter.

3.MD.3	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

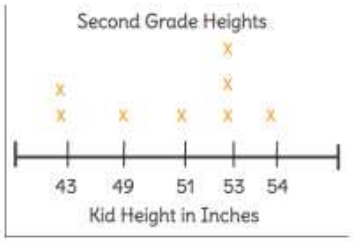
- Reading a graph requires students to interpret the information both horizontally and vertically.
- Pictures and bars can represent numbers in graphs.
- Modeling and promoting of the following vocabulary terms is crucial: *scale, scaled picture graph, scaled bar graph, line plot, key* and *data.*
- The way that data is collected, organized and displayed influences interpretation. Although intervals are not always in single units, students may count each square as one unit.

- While exploring data concepts, students should collect data, analyze data, and interpret data. Students should analyze, interpret and create bar graphs and pictographs in real world situations.



3.MD.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

- Show measurements on a line plot to display the information in an organized way.



- Assure that students are accurately lining up the objects to be measure on the line plot and that the X's used are the same size to avoid misinterpretation of the data.
- Measure length using rulers marked with inch, quarter inch and half inch. Accurately measure several small objects using a standard ruler and display findings on a line plot. Third graders need many opportunities measuring the length of various objects in their environment.

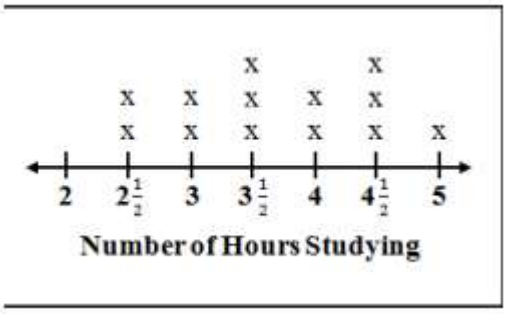
Example:

Measure objects in your desk to the nearest $\frac{1}{2}$ inch or $\frac{1}{4}$ of an inch.

Display data collected on a line plot.

How many objects measured $\frac{1}{2}$ inch? $\frac{1}{4}$ inch ?

Display data on line plots with horizontal scales in whole numbers, halves, and quarter.



- Students should connect their understanding of fractions to the measuring of one-half and one-quarter inch.

3.G.1	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

- Teacher promotes understanding of the structure of rectangular arrays and describing and analyzing two-dimensional shapes. Sets the tone and creates activities to help students investigate quadrilaterals (technology may be used during this exploration). Students recognize shapes that are and are not quadrilaterals by examining the properties of the geometric figures.
- Shapes in different categories share attributes.
- Quadrilaterals are figures with four sides.
- Students should be encouraged to provide details and use proper vocabulary when describing the properties of quadrilaterals. They sort geometric figures (see examples below) and identify squares, rectangles, and rhombuses as quadrilaterals.

- They conceptualize that a quadrilateral must be a closed figure with four straight sides and begin to notice characteristics of the angles and the relationship between opposite sides.
- Model vocabulary with numerous examples and encourage students to use geometric terms such as *properties, attributes, quadrilateral, open figure, closed figure, rhombus, rectangle,* and *square.*

MIF Lesson Structure

	LESSON STRUCTURE	RESOURCES	COMMENTS
PRE TEST	**Chapter Opener** Assessing Prior Knowledge *The Pre Test serves as a diagnostic test of readiness of the upcoming chapter*	**Teacher Materials** Quick Check Pretest (Assessm't Bk) Recall Prior Knowledge **Student Materials** Student Book (Quick Check); Copy of the Pre Test; Recall prior Knowledge	Recall Prior Knowledge (RPK) can take place just before the pre-tests are given and can take 1-2 days to front load prerequisite understanding Quick Check can be done in concert with the RPK and used to repair student misunderstandings and vocabulary prior to the pre-test ; Students write Quick Check answers on a separate sheet of paper Quick Check and the Pre Test can be done in the same block *(See Anecdotal Checklist; Transition Guide)* Recall Prior Knowledge – Quick Check – Pre Test
DIRECT ENGAGEMENT	**Direct Involvement/Engagement** Teach/Learn *Students are directly involved in making sense, themselves, of the concepts – by interacting the tools, manipulatives, each other, and the questions*	**Teacher Edition** 5-minute warm up Teach; Anchor Task **Technology** Digi **Other** Fluency Practice	• The Warm Up activates prior knowledge for each new lesson • Student Books are CLOSED; Big Book is used in Gr. K • Teacher led; Whole group • Students use concrete manipulatives to explore concepts • A few select parts of the task are explicitly shown, but the majority is addressed through the hands-on, constructivist approach and questioning • Teacher facilitates; Students find the solution
GUIDED LEARNING	**Guided Learning and Practice** Guided Learning	**Teacher Edition** Learn **Technology** Digi **Student Book** Guided Learning Pages Hands-on Activity	Students-already in pairs /small, homogenous ability groups; Teacher circulates between groups; Teacher, anecdotally, captures student thinking **Small Group w/Teacher circulating among groups** Revisit Concrete and Model Drawing; Reteach Teacher spends majority of time with struggling learners; some time with on level, and less time with advanced groups Games and Activities can be done at this time

INDEPENDENT PRACTICE	**Independent Practice** *A formal formative assessment*	**Teacher Edition** Let's Practice **Student Book** Let's Practice **Differentiation Options** All: Workbook Extra Support: Reteach On Level: Extra Practice Advanced: Enrichment	**Let's Practice** determines readiness for Workbook and small group work and is used as formative assessment; Students not ready for the Workbook will use Reteach. The Workbook is continued as Independent Practice. Manipulatives **CAN** be used as a communications tool as needed. Completely Independent On level/advance learners should finish all workbook pages.
ADDITIONAL PRACTICE	**Extending the Lesson**	Math Journal Problem of the Lesson Interactivities Games	
	Lesson Wrap Up	Problem of the Lesson Homework (Workbook , Reteach, or Extra Practice)	Workbook or Extra Practice Homework is only assigned when students fully understand the concepts (as additional practice) Reteach Homework (issued to struggling learners) should be checked the next day
POST TEST	**End of Chapter Wrap Up and Post Test**	**Teacher Edition** Chapter Review/Test Put on Your Thinking Cap **Student Workbook** Put on Your Thinking Cap **Assessment Book** Test Prep	Use Chapter Review/Test as "review" for the End of Chapter Test Prep. Put on your Thinking Cap prepares students for novel questions on the Test Prep; Test Prep is graded/scored. The Chapter Review/Test can be completed • Individually (e.g. for homework) then reviewed in class • As a 'mock test' done in class and doesn't count • As a formal, in class review where teacher walks students through the questions Test Prep is completely independent; scored/graded Put on Your Thinking Cap (green border) serve as a capstone problem and are done just before the Test Prep and should be treated as Direct Engagement. By February, students should be doing the Put on Your Thinking Cap problems on their own.

Misconceptions

- Before teaching elapsed time, make sure students can tell time to the minute on an analog clock.

- Students may incorrectly think about size as they determine estimates for mass. To avoid this common error, allow students to handle and touch all objects before they give an estimate.

- Some students may be challenged by interpreting a graph because we read from left to right. Reading a graph requires students to interpret the information both horizontally and vertically. Pointing this out to students may help. Often, intervals on a bar graph may confuse students.

- Some students may mark Xs on the line plot as different sizes, some small and some large.

- A common error in measuring is that some students do not accurately line up the object to be measured. Instead of starting with the zero point on the ruler, students often start measuring at the one-inch marking on the ruler.

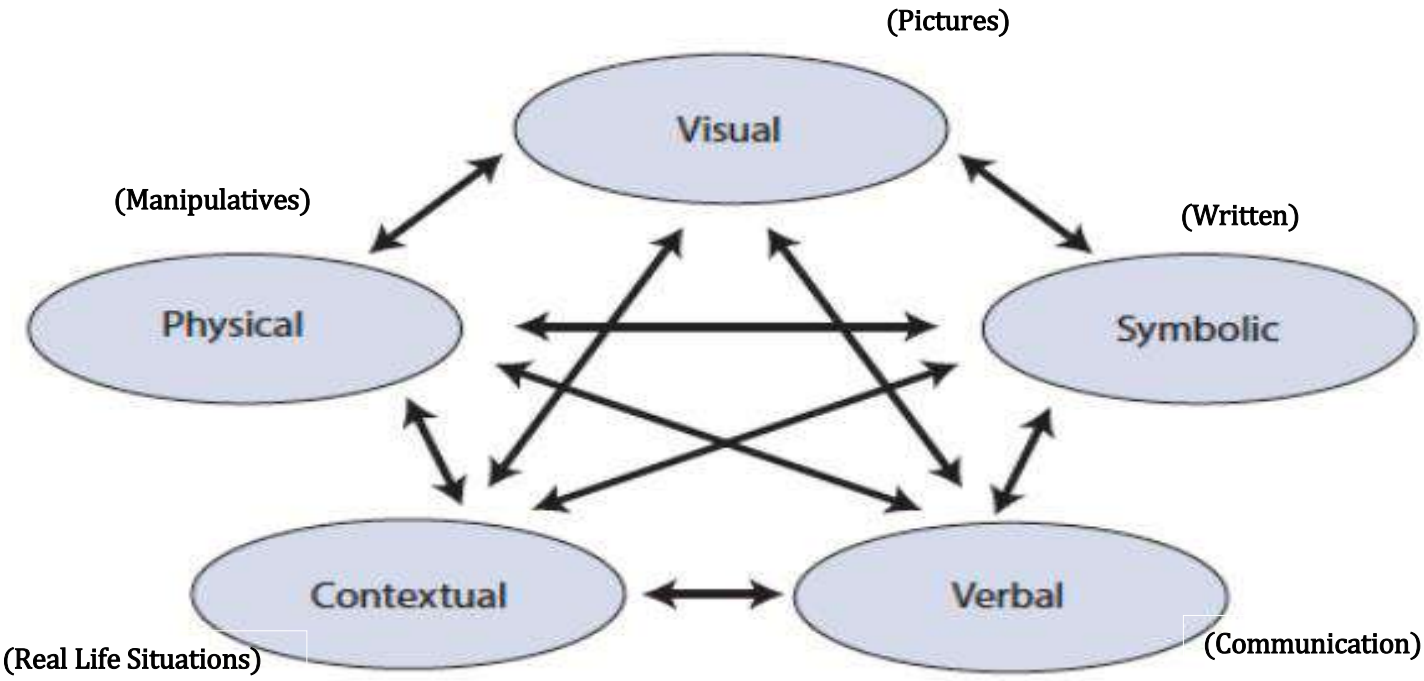
- Some third graders may not understand that a square is a rectangle because it has all the properties of a rectangle. Some children may be able to tell the properties of each shape separately, but may not figure out the relationships between the shapes.

PARCC Assessment Evidence/Clarification Statements

NJSLS	Evidence Statement	Clarification	Math Practices
3.MD.1-2	Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.	• Only the answer is required. • Tasks do not involve reading start/stop times from a clock nor calculating elapsed time	MP.1, MP 2, MP.4, MP.5
3.MD.2-1	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).	• Estimates are the result of reading a scale.	
3.MD.2-2	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.	• Only the answer is required (methods, representations, etc. are not assessed here). • Units of grams (g), kilograms (kg), and liters (l).	MP.1, MP.2, MP.4, MP.5
3.MD.2-3	Measure or estimate liquid volumes or masses of objects using standard units of grams (g), kilograms (kg), and liters (l), then use the estimated value(s) to estimate the answer to a one-step word problem by using addition, subtraction, multiplication, or division. Content Scope: 3.MD.2		MP.5, MP.6 (in the case of measuring)
3.MD.3-1	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. For example, draw a bar graph in which each square in the bar graph might represent 5 pets	• Tasks involve no more than 10 items in 2-5 categories. • Categorical data should not take the form of a category that could be represented numerically (e.g. ages of students). • Tasks do not require students to create the entire graph, but might ask students to complete a graph or otherwise demonstrate knowledge of its creation.	MP 2
3.MD.3-3	Solve a put-together problem using information presented in a scaled bar	• Tasks do not require computations beyond the grade 3 expectations.	MP 4

	graph, then use the result to answer a “how many more” or “how many less” problem using information presented in the scaled bar graph. Content Scope: 3.MD.3		
3.MD.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.		MP 2, 5
3.G.1	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.		

Use and Connection of Mathematical Representations



The Lesh Translation Model

Each oval in the model corresponds to one way to represent a mathematical idea.

Visual: When children draw pictures, the teacher can learn more about what they understand about a particular mathematical idea and can use the different pictures that children create to provoke a discussion about mathematical ideas. Constructing their own pictures can be a powerful learning experience for children because they must consider several aspects of mathematical ideas that are often assumed when pictures are pre-drawn for students.

Physical: The manipulatives representation refers to the unifix cubes, base-ten blocks, fraction circles, and the like, that a child might use to solve a problem. Because children can physically manipulate these objects, when used appropriately, they provide opportunities to compare relative sizes of objects, to identify patterns, as well as to put together representations of numbers in multiple ways.

Verbal: Traditionally, teachers often used the spoken language of mathematics but rarely gave students opportunities to grapple with it. Yet, when students do have opportunities to express their mathematical reasoning aloud, they may be able to make explicit some knowledge that was previously implicit for them.

Symbolic: Written symbols refer to both the mathematical symbols and the written words that are associated with them. For students, written symbols tend to be more abstract than the other representations. I tend to introduce symbols after students have had opportunities to make connections among the other representations, so that the students have multiple ways to connect the symbols to mathematical ideas, thus increasing the likelihood that the symbols will be comprehensible to students.

Contextual: A relevant situation can be any context that involves appropriate mathematical ideas and holds interest for children; it is often, but not necessarily, connected to a real-life situation.

The Lesh Translation Model: Importance of Connections

As important as the ovals are in this model, another feature of the model is even more important than the representations themselves: The arrows! The arrows are important because they represent the connections students make between the representations. When students make these connections, they may be better able to access information about a mathematical idea, because they have multiple ways to represent it and, thus, many points of access.

Individuals enhance or modify their knowledge by building on what they already know, so the greater the number of representations with which students have opportunities to engage, the more likely the teacher is to tap into a student's prior knowledge. This "tapping in" can then be used to connect students' experiences to those representations that are more abstract in nature (such as written symbols). Not all students have the same set of prior experiences and knowledge. Teachers can introduce multiple representations in a meaningful way so that students' opportunities to grapple with mathematical ideas are greater than if their teachers used only one or two representations.

Concrete Pictorial Abstract (CPA) Instructional Approach

The CPA approach suggests that there are three steps necessary for pupils to develop understanding of a mathematical concept.

> **Concrete:** "Doing Stage": Physical manipulation of objects to solve math problems.
>
> **Pictorial:** "Seeing Stage": Use of imaged to represent objects when solving math problems.
>
> **Abstract:** "Symbolic Stage": Use of only numbers and symbols to solve math problems.

CPA is a gradual systematic approach. Each stage builds on to the previous stage. Reinforcement of concepts are achieved by going back and forth between these representations and making connections between stages. Students will benefit from seeing parallel samples of each stage and how they transition from one to another.

Read, Draw, Write Process

READ the problem. Read it over and over…. And then read it again.

DRAW a picture that represents the information given. During this step students ask themselves: Can I draw something from this information? What can I draw? What is the best model to show the information? What conclusions can I make from the drawing?

WRITE your conclusions based on the drawings. This can be in the form of a number sentence, an equation, or a statement.

Students are able to draw a model of what they are reading to help them understand the problem. Drawing a model helps students see which operation or operations are needed, what patterns might arise, and which models work and do not work. Students must dive deeper into the problem by drawing models and determining which models are appropriate for the situation.

While students are employing the RDW process they are using several Standards for Mathematical Practice and in some cases, all of them.

Mathematical Discourse and Strategic Questioning

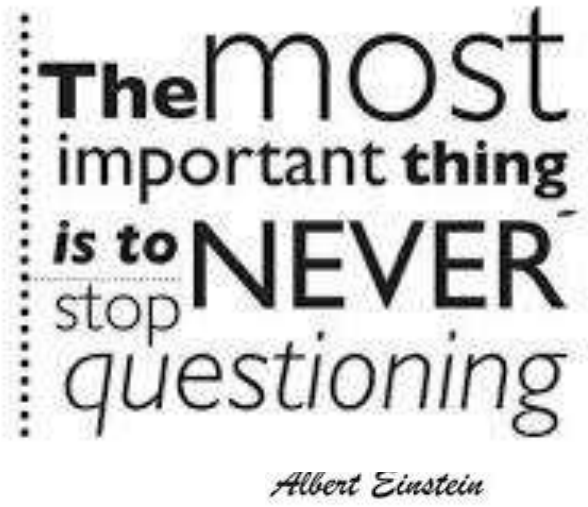
Discourse involves asking strategic questions that elicit from students their understanding of the context and actions taking place in a problem, how a problem is solved and why a particular method was chosen. Students learn to critique their own and others' ideas and seek out efficient mathematical solutions.

While classroom discussions are nothing new, the theory behind classroom discourse stems from constructivist views of learning where knowledge is created internally through interaction with the environment. It also fits in with socio-cultural views on learning where students working together are able to reach new understandings that could not be achieved if they were working alone.

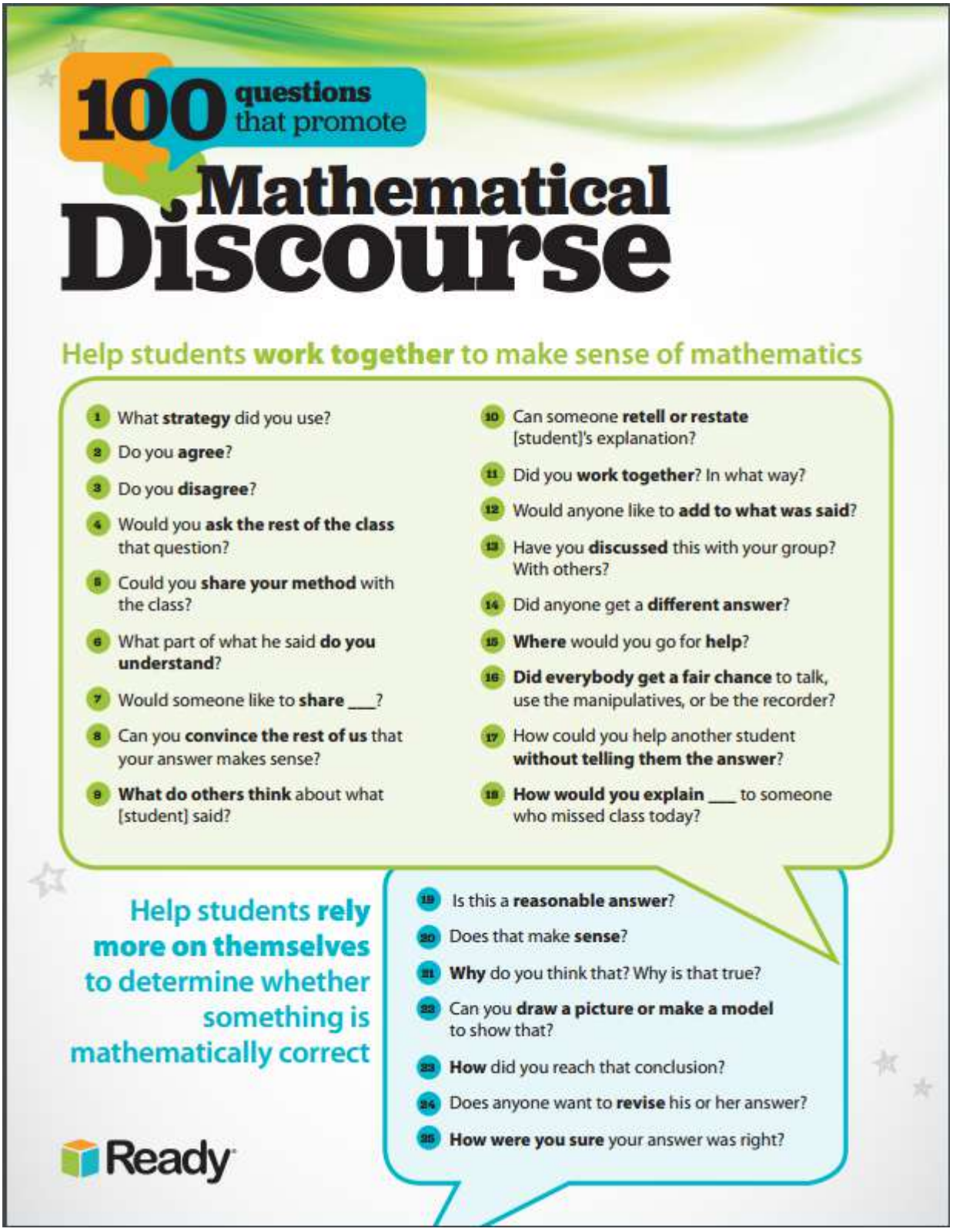
Underlying the use of discourse in the mathematics classroom is the idea that mathematics is primarily about reasoning not memorization. Mathematics is not about remembering and applying a set of procedures but about developing understanding and explaining the processes used to arrive at solutions.

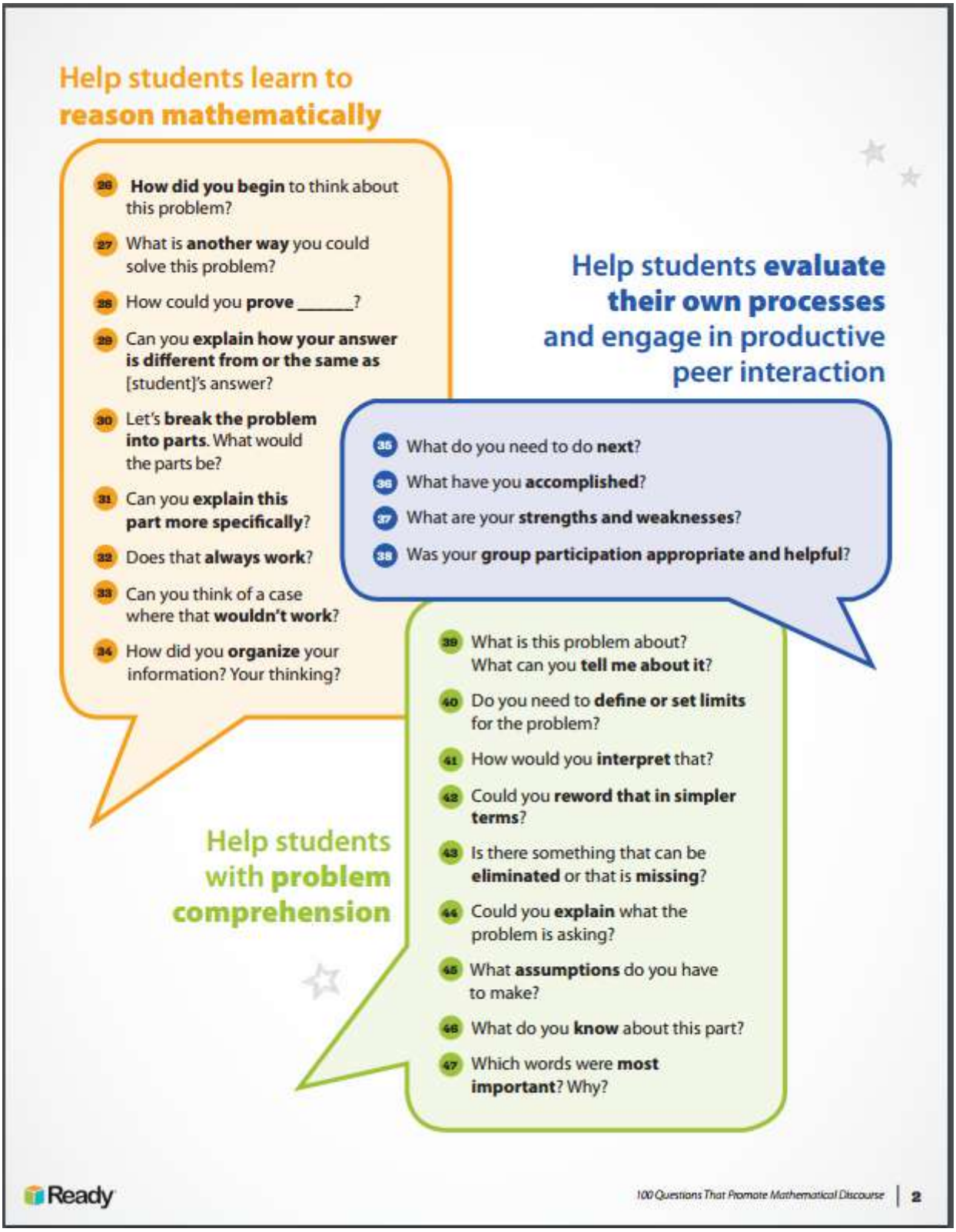
<u>Teacher Questioning:</u>

Asking better questions can open new doors for students, promoting mathematical thinking and classroom discourse. Can the questions you're asking in the mathematics classroom be answered with a simple “yes” or “no,” or do they invite students to deepen their understanding?



To help you encourage deeper discussions, here are 100 questions to incorporate into your instruction by Dr. Gladis Kersaint, mathematics expert and advisor for Ready Mathematics.




Help students learn to reason mathematically
26 How did you begin to think about this problem?
27 What is another way you could solve this problem?
28 How could you prove _____?
29 Can you explain how your answer is different from or the same as [student]'s answer?
30 Let's break the problem into parts. What would the parts be?
31 Can you explain this part more specifically?
32 Does that always work?
33 Can you think of a case where that wouldn't work?
34 How did you organize your information? Your thinking?
Help students evaluate their own processes and engage in productive peer interaction
35 What do you need to do next?
36 What have you accomplished?
37 What are your strengths and weaknesses?
38 Was your group participation appropriate and helpful?
Help students with problem comprehension
39 What is this problem about? What can you tell me about it?
40 Do you need to define or set limits for the problem?
41 How would you interpret that?
42 Could you reword that in simpler terms?
43 Is there something that can be eliminated or that is missing?
44 Could you explain what the problem is asking?
45 What assumptions do you have to make?
46 What do you know about this part?
47 Which words were most important? Why?
Ready
100 Questions That Promote Mathematical Discourse | 2

Help students learn to **conjecture, invent, and solve** problems

48. **What would happen if ___?**
49. Do you see a **pattern**?
50. What are some **possibilities** here?
51. Where could you find the **information** you need?
52. How would you **check your steps** or your answer?
53. What **did not work**?
54. How is your solution method the **same as or different from** [student]'s method?
55. Other than retracing your steps, **how can you determine** if your answers are appropriate?
56. How did you **organize** the information? Do you have a **record**?
57. How could you solve this using **tables, lists, pictures, diagrams**, etc.?
58. What have you tried? What **steps** did you take?
59. How would it look if you used this **model** or these **materials**?
60. How would you draw a **diagram or make a sketch** to solve the problem?
61. Is there **another possible answer**? If so, explain.
62. Is there **another way to solve** the problem?
63. Is there **another model** you could use to solve the problem?
64. Is there anything you've **overlooked**?
65. **How did you think** about the problem?
66. What was your **estimate or prediction**?
67. How **confident** are you in your answer?
68. **What else** would you like to know?
69. What do you think comes **next**?
70. Is the solution **reasonable**, considering the context?
71. Did you have a **system**? Explain it.
72. Did you have a **strategy**? Explain it.
73. Did you have a **design**? Explain it.

Help students learn to **connect mathematics, its ideas, and its application**

74. What is the **relationship** between ___ and ___?
75. Have we ever solved a problem **like this before**?
76. What uses of mathematics did you find in the **newspaper** last night?
77. What is the **same**?
78. What is **different**?
79. Did you use skills or build on concepts that were **not necessarily mathematical**?
80. Which **skills or concepts** did you use?
81. What **ideas** have we explored before that were useful in solving this problem?
82. Is there a **pattern**?
83. **Where else** would this strategy be useful?
84. How does this **relate** to ___?
85. Is there a **general rule**?
86. Is there a **real-life situation** where this could be used?
87. How would your method work with **other problems**?
88. What other problem does this seem to **lead to**?

Help students persevere

89. Have you tried making a **guess**?
90. **What else** have you tried?
91. Would **another method** work as well or better?
92. Is there **another way** to draw, explain, or say that?
93. Give me another **related problem**. Is there an easier problem?
94. How would you **explain** what you know right now?

95. What was **one thing you learned** (or two, or more)?
96. Did you **notice any patterns**? If so, describe them.
97. What **mathematics topics** were used in this investigation?
98. What were the **mathematical ideas** in this problem?
99. What is mathematically **different about these two situations**?
100. What are the **variables** in this problem? What stays **constant**?

Help students focus on the mathematics from **activities**

Conceptual Understanding

Students demonstrate conceptual understanding in mathematics when they provide evidence that they can:

- recognize, label, and generate examples of concepts;
- use and interrelate models, diagrams, manipulatives, and varied representations of concepts;
- identify and apply principles; know and apply facts and definitions;
- compare, contrast, and integrate related concepts and principles; and
- recognize, interpret, and apply the signs, symbols, and terms used to represent concepts.

Conceptual understanding reflects a student's ability to reason in settings involving the careful application of concept definitions, relations, or representations of either.

Procedural Fluency

Procedural fluency is the ability to:

- apply procedures accurately, efficiently, and flexibly;
- to transfer procedures to different problems and contexts;
- to build or modify procedures from other procedures; and
- to recognize when one strategy or procedure is more appropriate to apply than another.

Procedural fluency is more than memorizing facts or procedures, and it is more than understanding and being able to use one procedure for a given situation. Procedural fluency builds on a foundation of conceptual understanding, strategic reasoning, and problem solving (NGA Center & CCSSO, 2010; NCTM, 2000, 2014). Research suggests that once students have memorized and practiced procedures that they do not understand, they have less motivation to understand their meaning or the reasoning behind them (Hiebert, 1999). Therefore, the development of students' conceptual understanding of procedures should precede and coincide with instruction on procedures.

Math Fact Fluency: Automaticity

Students who possess math fact fluency can recall math facts with automaticity. Automaticity is the ability to do things without occupying the mind with the low-level details required, allowing it to become an automatic response pattern or habit. It is usually the result of learning, repetition, and practice.

3-5 Math Fact Fluency Expectation

3.OA.C.7: Single-digit products and quotients (Products from memory by end of Grade 3)

3.NBT.A.2: Add/subtract within 1000

4.NBT.B.4: Add/subtract within 1,000,000/ Use of Standard Algorithm

5.NBT.B.5: Multi-digit multiplication/ Use of Standard Algorithm

Evidence of Student Thinking

Effective classroom instruction and more importantly, improving student performance, can be accomplished when educators know how to elicit evidence of students' understanding on a daily basis. Informal and formal methods of collecting evidence of student understanding enable educators to make positive instructional changes. An educators' ability to understand the processes that students use helps them to adapt instruction allowing for student exposure to a multitude of instructional approaches, resulting in higher achievement. By highlighting student thinking and misconceptions, and eliciting information from more students, all teachers can collect more representative evidence and can therefore better plan instruction based on the current understanding of the entire class.

Mathematical Proficiency

To be mathematically proficient, a student must have:

• Conceptual understanding: comprehension of mathematical concepts, operations, and relations;

• Procedural fluency: skill in carrying out procedures flexibly, accurately, efficiently, and appropriately;

• Strategic competence: ability to formulate, represent, and solve mathematical problems;

• Adaptive reasoning: capacity for logical thought, reflection, explanation, and justification;

• Productive disposition: habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

Evidence should:

- Provide a window in student thinking;
- Help teachers to determine the extent to which students are reaching the math learning goals; and
- Be used to make instructional decisions during the lesson and to prepare for subsequent lessons.

Formative assessment is an essentially interactive process, in which the teacher can find out whether what has been taught has been learned, and if not, to do something about it. Day-to-day formative assessment is one of the most powerful ways of improving learning in the mathematics classroom.

(Wiliam 2007, pp. 1054; 1091)

Connections to the Mathematical Practices

Student Friendly Connections to the Mathematical Practices

1. I can solve problems without giving up.
2. I can think about numbers in many ways.
3. I can explain my thinking and try to understand others.
4. I can show my work in many ways.
5. I can use math tools and tell why I choose them.
6. I can work carefully and check my work.
7. I can use what I know to solve new problems.
8. I can discover and use short cuts.

Connections to the Mathematical Practices

1	**Make sense of problems and persevere in solving them**
	In **third** grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try approaches. They often will use another method to check their answers.
2	**Reason abstractly and quantitatively**
	In **third** grade, students should recognize that number represents a specific quantity. They connect quantity to written symbols and create logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities
3	**Construct viable arguments and critique the reasoning of others**
	In **third** grade, mathematically proficient students may construct viable arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like, "How did you get that?" and "Why is it true?" They explain their thinking to others and respond to others' thinking.
4	**Model with mathematics**
	Mathematically proficient students experiment with representing problem situations in multiple ways including numbers, words (mathematical language) drawing pictures, using objects, acting out, making chart, list, or graph, creating equations etc…Students need opportunities to connect different representations and explain the connections. They should be able to use all of the representations as needed. **Third** graders should evaluate their results in the context of the situation and reflect whether the results make any sense.
5	**Use appropriate tools strategically**
	Third graders should consider all the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For example, they might use graph paper to find all possible rectangles with the given perimeter. They compile all possibilities into an organized list or a table, and determine whether they all have the possible rectangles.
6	**Attend to precision**
	Mathematical proficient **third** graders develop their mathematical communication skills; they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying their units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle the record their answer in square units.

7	**Look for and make use of structure**
	In **third** grade, students should look closely to discover a pattern of structure. For example, students' properties of operations as strategies to multiply and divide. (commutative and distributive properties.
8	**Look for and express regularity in repeated reasoning**
	Mathematically proficient students in third **grade** should notice repetitive actions in computation and look for more shortcut methods. For example, students may use the distributive property as a strategy for using products they know to solve products that they don't know. For example, if students are asked to find the product of 7x8, they might decompose 7 into 5 and 2 and then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, "Does this make sense?"

Effective Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

5 Practices for Orchestrating Productive Mathematics Discussions	
Practice	Description/ Questions
1. Anticipating	What strategies are students likely to use to approach or solve a challenging high-level mathematical task? How do you respond to the work that students are likely to produce? Which strategies from student work will be most useful in addressing the mathematical goals?
2. Monitoring	Paying attention to what and how students are thinking during the lesson. Students working in pairs or groups Listening to and making note of what students are discussing and the strategies they are using Asking students questions that will help them stay on track or help them think more deeply about the task. (Promote productive struggle)
3. Selecting	This is the process of deciding the *what* and the *who* to focus on during the discussion.
4. Sequencing	What order will the solutions be shared with the class?
5. Connecting	Asking the questions that will make the mathematics explicit and understandable. Focus must be on mathematical meaning and relationships; making links between mathematical ideas and representations.

3rd and 4th Grade Ideal Math Block

Essential Components

FLUENCY: Partner/Small Group — 5 min.

CONCRETE, PICTORIAL, and **ABSTRACT** approaches to support **ARITHMETIC FLUENCY** and **FLUENT USE OF STRATEGIES.**

LAUNCH: Whole Group — 15-20 min.

Anchor Task: Math in Focus Learn

EXPLORATION: Partner / Small Group

Math in Focus Hands-On, Guided Practice, Let's Explore

INDEPENDENT PRACTICE: Individual

Math in Focus Let's Practice, Workbook, Reteach, Extra Practice, Enrichment

MATH WORKSTATIONS: Pairs / Small Group/ Individual — 15-20 min.

DIFFERENTIATED activities designed to **RETEACH, REMEDIATE, ENRICH** student's understanding of concepts.

- **Small Group Instruction**
- **Technology Lab**
- **Problem Solving Lab**
- **Fluency Lab**
- **Math Journal Lab**

SUMMARY: Whole Group

Lesson Closure: Student Reflection; Real Life Connections to Concept

EXIT TICKET (DOL): Individual — 5 min.

Students complete independently; Used to guide instructional decisions; Used to set instructional goals for students;

Note:

- Place emphasis on the flow of the lesson in order to ensure the development of students' conceptual understanding.
- Outline each essential component within lesson plans.
- Math Workstations may be conducted in the beginning of the block in order to utilize additional support staff.
- Recommended: 5-10 technology devices for use within **TECHNOLOGY** and **FLUENCY** workstations.

Unit 3 Assessment / Authentic Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded**
Chapter 11	Metric Length, Mass, Volume			
Optional Chapter 19 Test/Performance Task	3.MD.2	1 block	Individual	Yes
Authentic Assessment : Strips of Paper	3.MD.4	½block	Individual	Yes
Chapter 13	Bar Graphs and Line Plots			
Optional Chapter 13 Test/Performance Task	3.MD.3	1 block	Individual	Yes
Chapter 18	Two-Dimensional Shapes			
Optional Chapter 18 Test/Performance Task	3.G.1	1 block	Individual	Yes
i-Ready Standards Mastery Assessment		1 block	Individual	No

	PLD	**Genesis Conversion**
Rubric Scoring	PLD 5	100
	PLD 4	89
	PLD 3	79
	PLD 2	69
	PLD 1	59

Authentic Assessment– Strips of Paper

Measure the strips of paper to the nearest $\frac{1}{2}$ inch. Use the data to create a line plot. Be sure to label and include a title.

Name two facts that describe the data on your line plot.

1.) _____

_____

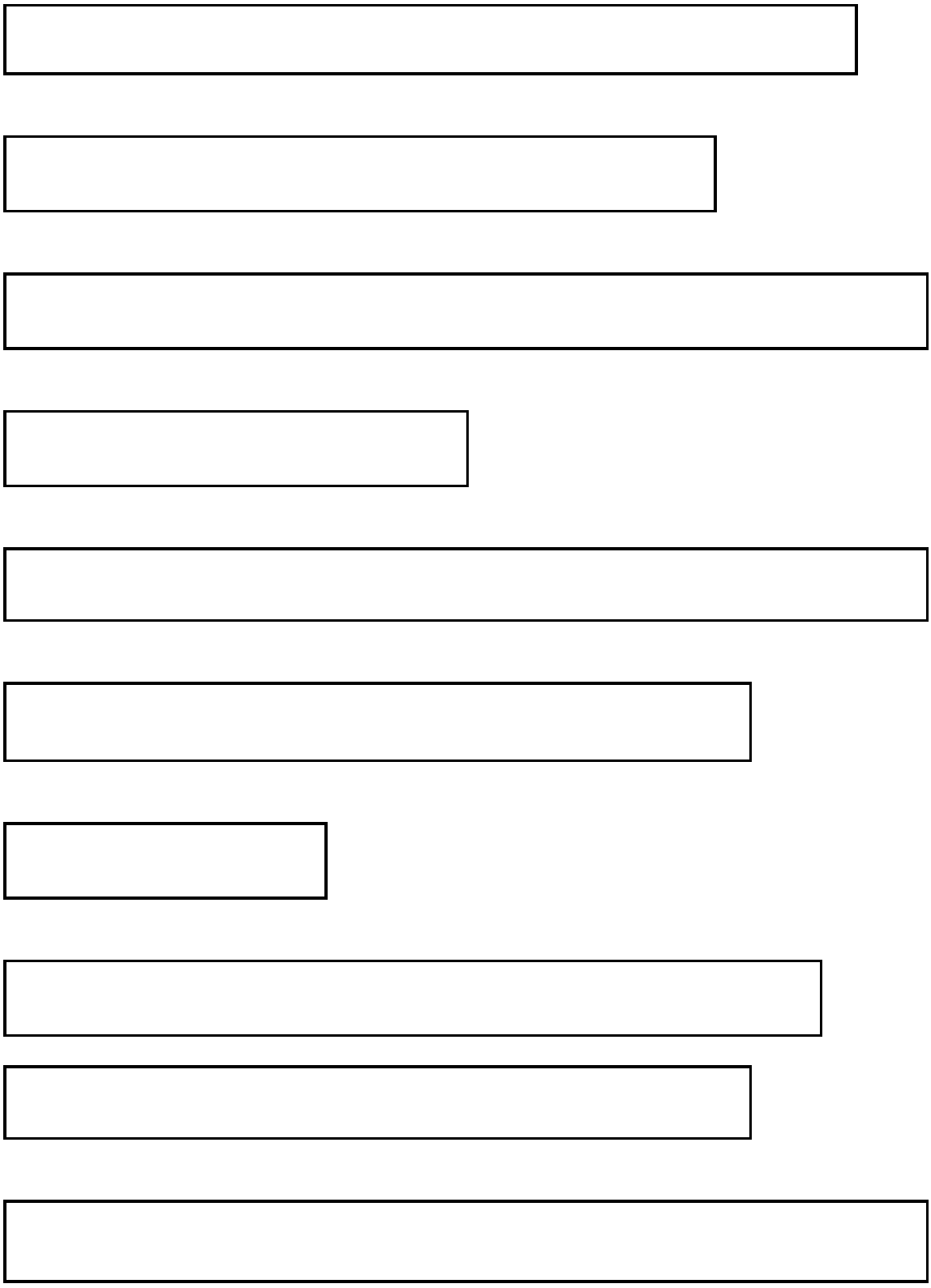
_____

_____

2.) _____

_____

_____



3.MD.4: Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

No Command	**Partial Accomplishment**	**Substantial Accomplishment**	**Complete Mastery**
All is incorrect	Students who demonstrate partial accomplishment may measure the strips accurately, but may not be able to complete the line plot correctly. OR Students might have difficulty measuring the strips accurately, which would result in incorrect results on the line plot.	Students who demonstrate substantial accomplishment accurately measure the lengths of all of the strips and correctly use one x for each measurement on the line plot. But they might have difficulty/need assistance stating two facts about their line plot.	Students who demonstrate complete mastery accurately measure the lengths of all of the strips and correctly use one x for each measurement on the line plot. Students should also be able to write two facts about their line plot.

21st Century Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.