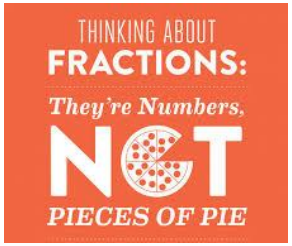
Extending Multiplication and Division; Introducing Fractions

3rd Grade Unit 2

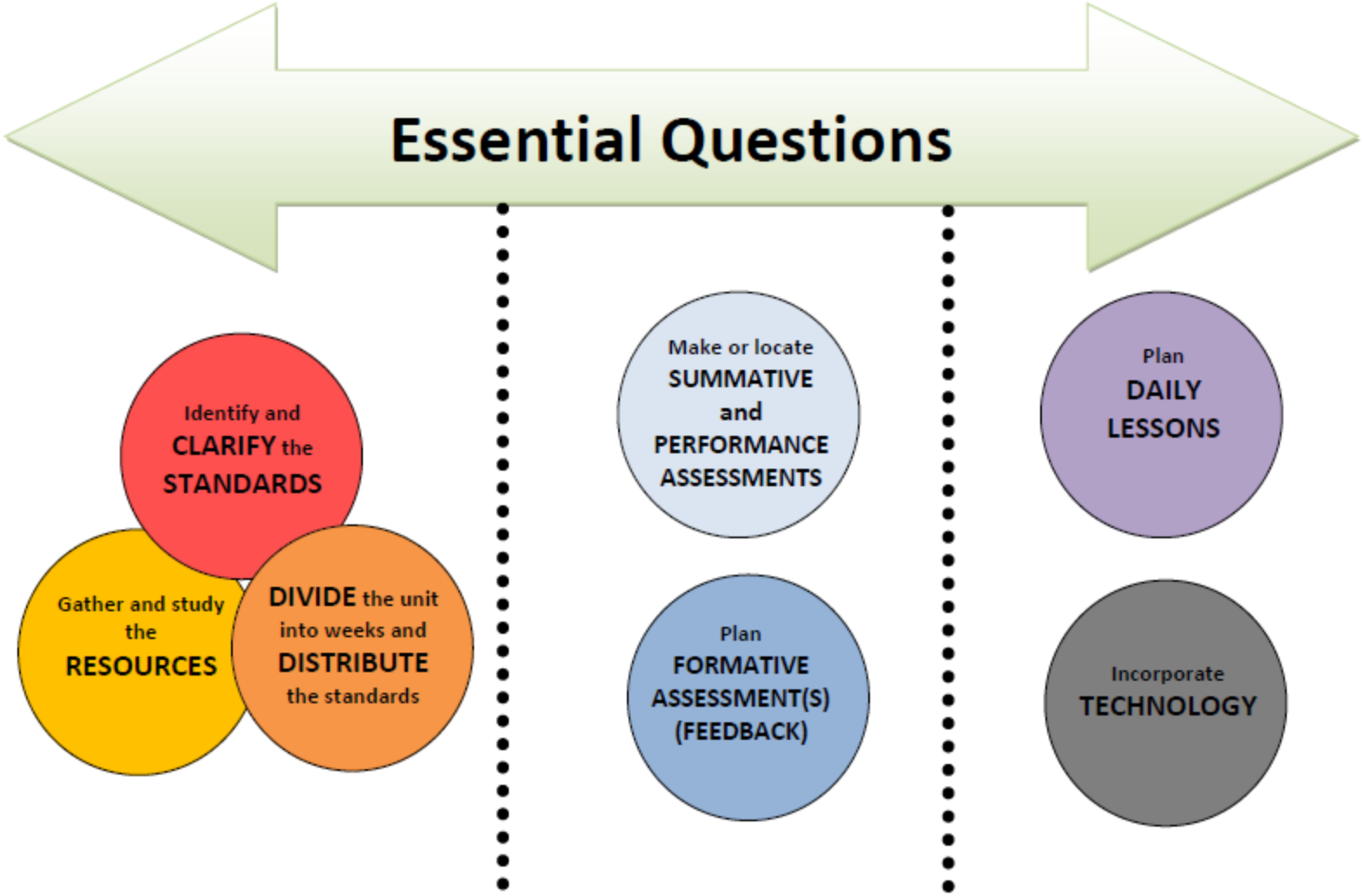


Unit Planning Team:

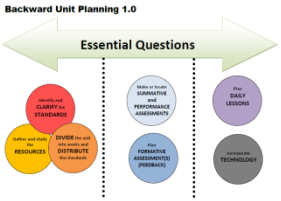
Kendra Bookout (ES), Pam Keith (ET), Sarah Henry (WS),

Kendree Kilsch (GH), Kyla Trammell (BG)

Backward Unit Planning 1.0



Essential Questions



R.P.S. Common Core Math Curriculum | 3rd Grade

2nd Quarter (p. 1 of 2) **Extending Multiplication and Division; Introducing Fractions**

Students will continue to develop their understandings of multiplication and division with factors 6-9. Students will start to rely less on the direct model, and more on the properties of operations by using facts they know to help them solve other multiplication problem situations. Students will use multiplication and division within 100 in equal grouping problem situations, which should include some 2-digit x 1-digit scenarios. Students will start to reason about the relationship between multiplication and division by using the inverse operations. In this unit, fractions are extended as students reason about fractions in both an area model and on a number line. Students will also generate measurement data by making a line plot using both whole numbers and fractional parts. Students will continue using all four operations in two-step problems and developing fluency adding and subtracting within 1000.

Essential Questions:

How can I efficiently solve problems?

How are multiplication and division related?

How can I represent and explain fractions as part of our number system?

How do I represent and interpret data?

Operations and Algebraic Thinking	
Represent and solve problems involving multiplication and division.	
3.OA.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
3.OA.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = ? ÷ 3, 6 x 6 = ?*
Understand properties of multiplication and the relationship between multiplication and division.	
3.OA.5	Apply properties of operations as strategies to multiply and divide. [Students need not use formal terms for these properties.] *Examples: If 6 x 4 = 24 is known, then 4 x 6 = 24 is also known. (Commutative property of multiplication.) 3 x 5 x 2 can be found by 3 x 5 = 15, then 15 x 2 = 30, or by 5 x 2 = 10, then 3 x 10 = 30. (Associative property of multiplication.) Knowing that 8 x 5 = 40 and 8 x 2 = 16, one can find 8 x 7 as 8 x (5 + 2) = (8 x 5) + (8 x 2) = 40 + 16 = 56. (Distributive property.)*
3.OA.6	Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.
Multiply and divide within 100.	
3.OA.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operation. By the end of Grade 3, know from memory all products of two one-digit numbers.
Solve problems involving the four operations, and identify and explain patterns in arithmetic.	
3.OA.8	Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. *[This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).]*

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3.OA.3 Multiplication and Division Problems in context- continues all year.

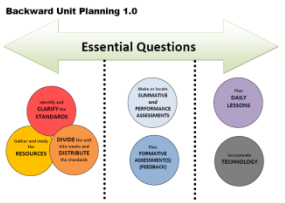
3.OA.4Focus on the missing part. Could be done with number talks or in discussion- continues all year.

3.OA.5 Properties:
Commutative: 3 x 2 = 2 x 3
Associative: 15 x 2 = (3 x 5) x 2 = 3 x (5 x 2) = 3 x 10 = 30
Distributive: 7 x 4 = (5 x 4) + (2 x 4)

3.OA.6 Inverse relationship between multiplication and division.

3.OA.7 Fluency this quarter should focus on using x2, x, 5, x10, etc. facts to derive the new facts with factors 6-9. Mastery by end of year.

3.OA.8 Multi-step problems using all four operations. Students need to represent their thinking with an equation. Introduction to the Order of Operations where multiplication and division are done before addition and subtraction.
i.e. 3 + 5 x 10 = 3 + 50 = 53; not 8 x 10 = 80



Identify and CLARIFY the STANDARDS

Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic. *[A range of algorithms may be used.]*

3.NBT.2	Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
3.NBT.3	Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 x 80, 5 x 60) using strategies based on place value and properties of operations.

Number and Operations - Fractions

[Grade 3 expectations in this domain are limited to fractions with denominators 2,3,4,6, and 8.]

Develop understanding of fractions as numbers

3.NF.1	Understand a fraction *1/b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by *a* parts of size *1/b*.
3.NF.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram.
	a. Represent a fraction *1/b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning i into *b* equal parts. Recognize that each part has size *1/b* and that the endpoint of the part based at 0 locates the numbe *1/b* on the number line.
	b. Represent a fraction *a/b* on a number line diagram by marking off a lengths *1/b* from 0. Recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line.

Measurement and Data

Represent and interpret data.

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.

Geometry

Reason with shapes and their attributes.

3.G.2	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

3.NBT.2 Continue working with addition and subtraction within 1000. Students should be developing strategies based on place value and the properties of operations.

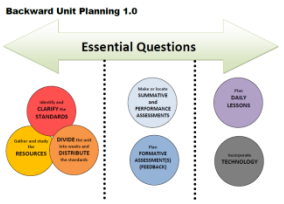
3.NBT.3 Multiply in groups of ten. Can push the associative property here.
5 x 60 = 5 x (6 x 10) = (5 x 6) x 10 = 30 x 10 = 300

3.NF.1 Students will need to see a fraction (i.e. ¼) as 1 part when the whole is partitioned into (4) equal parts. Also that a/b (i.e. ¾) is 1/b, a times (¾ = ¼ + ¼ + ¼)

3.NF.2 Fractions on a number line. Understanding it as the distance from 0. i.e. when finding 3/5 on a number line, it is 3 groups of 1/5 to the end point of 3/5.

3.MD.4 Creating a line plot with fractional units. Use as an application of 3.NF.2. Make sure to attend to the idea that they need to have equal space units on the number line with halves and fourths.

3.G.2 Use in conjunction with 3. NF.1- pose equal sharing problems where students will have to partition a shape into equal areas and notate with the fraction. This happens alongside 3.NF.1 in this Unit.



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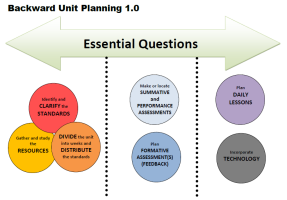


Suggested Weekly Posing of Problems:

This is one way to think about clustering the standards. These ideas would be repeated each week.

Essential Question: How Can I Efficiently Solve Problems?

1-2 days a week- Work on addition and subtraction multi-digit fluency and 2-step problems with all four operations. (3.NBT.2 and 3.OA.8)

DIVIDE the unit into weeks and DISTRIBUTE the standards

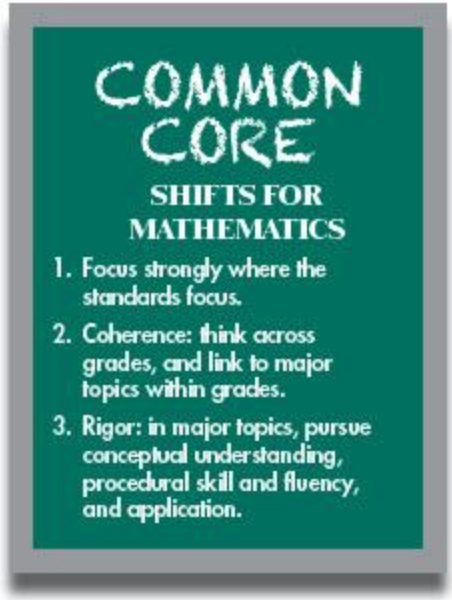
Essential Question: How are Multiplication and Division related?

2-3 days a week- Work on multiplication and division problems and fluency. Focusing on properties of operations and the relationship between multiplication and division. (3.OA.3, 3.OA.4, 3.OA.5, 3.OA.6, 3.OA.7, 3.NBT.3)

Essential Questions: How can I represent and explain fractions as a part of our number system?

How do I represent and interpret data?

2-3 days a week- Work on fraction concepts, equal sharing and fractions on a number line (3.NF.1, 3.NF.2, 3.G.2). Use line plot as an application of fractions on a number line (3.MD.4).



Week	Standards	Structure/Resources
1	**Addition /Subtraction Ideas** 3.NBT.2 +/- multi-digit fluency 3.OA.8 2 step problems **Multiplication/Division Ideas** 3.OA.3 x & division word problems 3.OA.4 x & division with unknown 3.OA.5 x & division properties 3.OA.7 x & division fluency	Pose +/- and multi-step problems Number Talks & Supplemental Number Talk Resource K-5mathteachingresources.com (Unit 2 Games and Activities) Unit 2 Daily Warm-Ups Pose x and division problems Mastering the Basic Math Facts-Multiplication and Division
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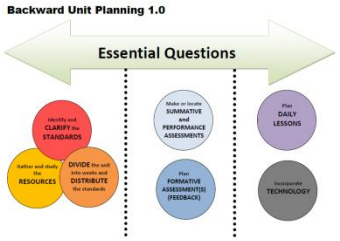

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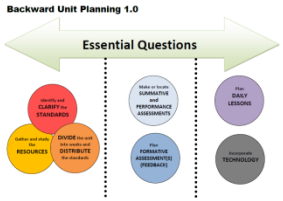
5	**Addition /Subtraction Ideas** 3.NBT.2 +/- multi-digit fluency **Multiplication/Division Ideas** 3.OA.7 x & division fluency **Fraction Ideas** 3.G.2 Partition shapes into fractional parts 3.NF.1 Understand fractions as 1/b	Pose +/- problems Number Talks & Supplemental Number Talk Resource K-5mathteachingresources.com (Unit 2 Games and Activities) Mastering the Basic Math Facts- Multiplication and Division Extending Children's Mathematics book
6	**Addition /Subtraction Ideas** 3.NBT.2 +/- multi-digit fluency **Multiplication/Division Ideas** 3.OA.7 x & division fluency **SHORT WEEK- THANKSGIVING BREAK- Focus on fluency**	Pose +/- problems Number Talks & Supplemental Number Talk Resource K-5mathteachingresources.com (Unit 2 Games and Activities) Mastering the Basic Math Facts- Multiplication and Division



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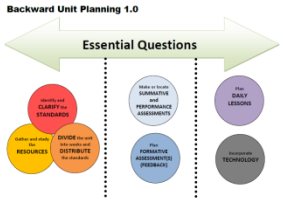

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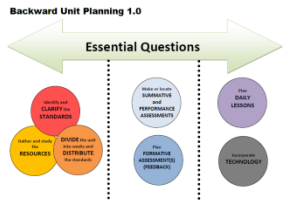
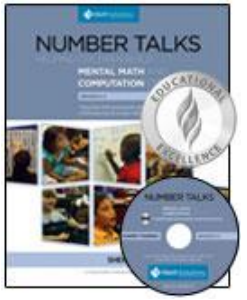
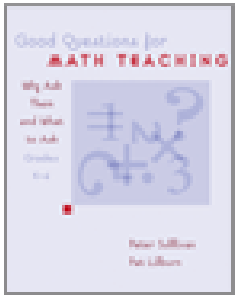
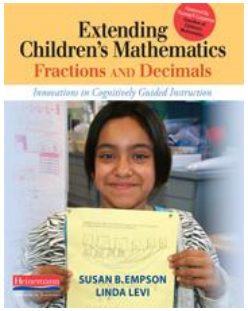
Gather and study the

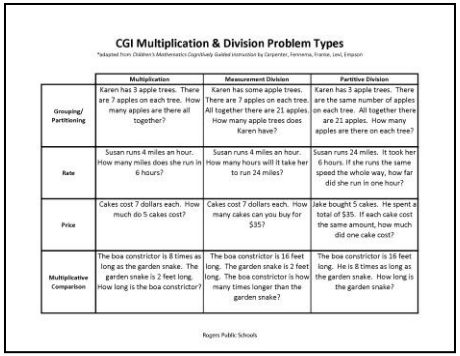
RESOURCES









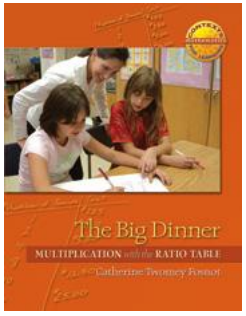


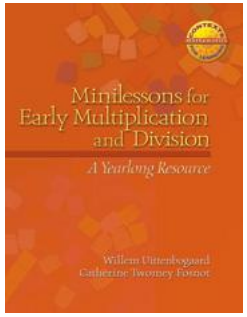
CGI Multiplication & Division Problem Types

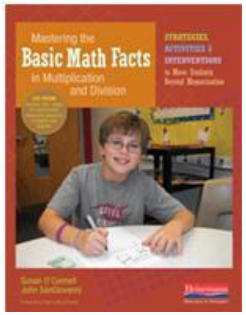
Adapted from Children's Mathematics Cognitively Guided Instruction by Carpenter, Fennema, Franke, Levi, Empson

	Multiplication	Measurement Division	Partitive Division
Grouping/ Partitioning	Karen has 3 apple trees. There are 7 apples on each tree. How many apples are there all together?	Karen has some apple trees. There are 7 apples on each tree. All together there are 21 apples. How many apple trees does Karen have?	Karen has 3 apple trees. There are the same number of apples on each tree. All together there are 21 apples. How many apples are there on each tree?
Rate	Susan runs 4 miles an hour. How many miles does she run in 6 hours?	Susan runs 4 miles an hour. How many hours will it take her to run 24 miles?	Susan runs 24 miles. It took her 6 hours. If she runs the same speed the whole way, how far did she run in one hour?
Price	Cakes cost 7 dollars each. How much do 5 cakes cost?	Cakes cost 7 dollars each. How many cakes can you buy for $35?	Jake bought 5 cakes. He spent a total of $35. If each cake cost the same amount, how much did one cake cost?
Multiplicative Comparison	The boa constrictor is 8 times as long as the garden snake. The garden snake is 2 feet long. How long is the boa constrictor?	The boa constrictor is 16 feet long. The garden snake is 2 feet long. The boa constrictor is how many times longer than the garden snake?	The boa constrictor is 16 feet long. He is 8 times as long as the garden snake. How long is the garden snake?

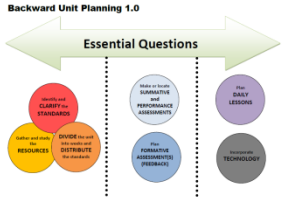
Rogers Public Schools







Options for Assessment – available online for Unit 2



<u>Essential Question:</u> How can I efficiently solve problems? 3.NBT.2/3.OA.8

Third Grade Summative Assessment – Unit 2

<u>Essential Question:</u> How can I efficiently solve problems? 3.NBT.2/3.OA.8

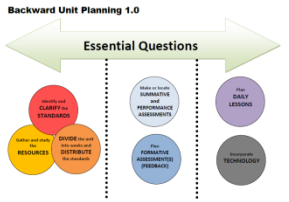
At McGarrah's Pumpkin patch, there are _____ vines of pumpkins. There are ___ pumpkins on each vine. Farmer McGarrah also has 25 small pumpkins that are just sitting in his field. How many pumpkins does Farmer McGarrah have altogether?

(7, 8) (6, 15) (7, 9) (7, 10)

The bakery at Wal-Mart baked 175 sugar cookies, 250 chocolate cookies, and 325 oatmeal cookies. At lunch, they sold 225 cookies. How many cookies did the bakery have left?

Make or locate SUMMATIVE and PERFORMANCE ASSESSMENTS

Options for Assessment – available online for Unit 2



Essential Question: How are multiplication and division related? continued.

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3.OA.3/3.OA.5
A chef is cooking chicken in a restaurant. The recipe says you need 5 minutes for every pound. How many minutes will it take to cook 12 pounds of chicken?

3.OA.3/3.OA.5/3.OA.6
Maria has 24 feet of ribbon and wants to wrap some gifts that need 6 feet of ribbon each. How many gifts can she wrap using the ribbon?

Essential Question: How are multiplication and division related?

3.NBT.3

90 x 2 = _____ 7 x 30 = _____

6 x 30 = _____ 40 x 5 = _____

3.OA.4

10 = 2 x ____ 14 = 2 x ____

60 ÷ ____ = 6 2 = 18 ÷ ____

Essential Question: How are multiplication and division related?

Draw a line to connect equal boxes. 3.OA.5

4 x 6	(6 x 2) + (6 x 1)
6 x 3	(8 x 5) + (8 x 2)
8 x 7	6 x 4
7 x 4	7 x 2 x 2

Make or locate SUMMATIVE and PERFORMANCE ASSESSMENTS

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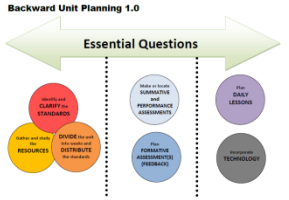


Essential Question: How are multiplication and division related? Continued…

Essential Question: How are multiplication and division related?

3.OA.5

Jim knows 5 x 4 but doesn't know 5 x 6.

How could Jim use 5 x 4 to find 5 x 6?

Essential Question: How are multiplication and division related?

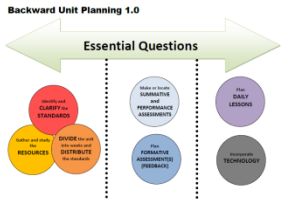
3.OA.5

Ella knows 3 x 8 but doesn't know 3 x 16.

How could Ella use 3 x 8 to find 3 x 16?

Make or locate SUMMATIVE and PERFORMANCE ASSESSMENTS

Options for Assessment – available online for Unit 2



Essential Question: How can I represent and explain fractions as part of our number system?

Make or locate **SUMMATIVE and PERFORMANCE ASSESSMENTS**

Essential Question: How can I represent and explain fractions as part of our number system?

3.NF.1

Show the meaning of 2/3 in two different ways.

Show the meaning of 3/4 in two different ways.

Essential Question: How can I represent and explain fractions as part of our number system?

Place each fraction on the number line. 3.NF.2

$\frac{1}{3}$ 0 1

$\frac{4}{4}$ 0 1

$\frac{4}{8}$ 0 1

$\frac{2}{8}$ 0 1

$\frac{2}{6}$ 0 1

Essential Question: How can I represent and explain fractions as part of our number system?

3.NF.1

Show the meaning of 2/3 in two different ways.

Show the meaning of 3/4 in two different ways.

Essential Question: How can I represent and explain fractions as part of our number system?

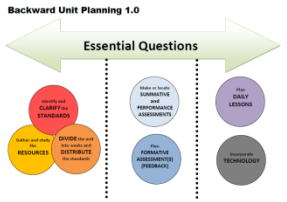
Label the points on the number line with the missing fractions. 3.NF.2

0 ___ ___ ___ ___ ___ 1

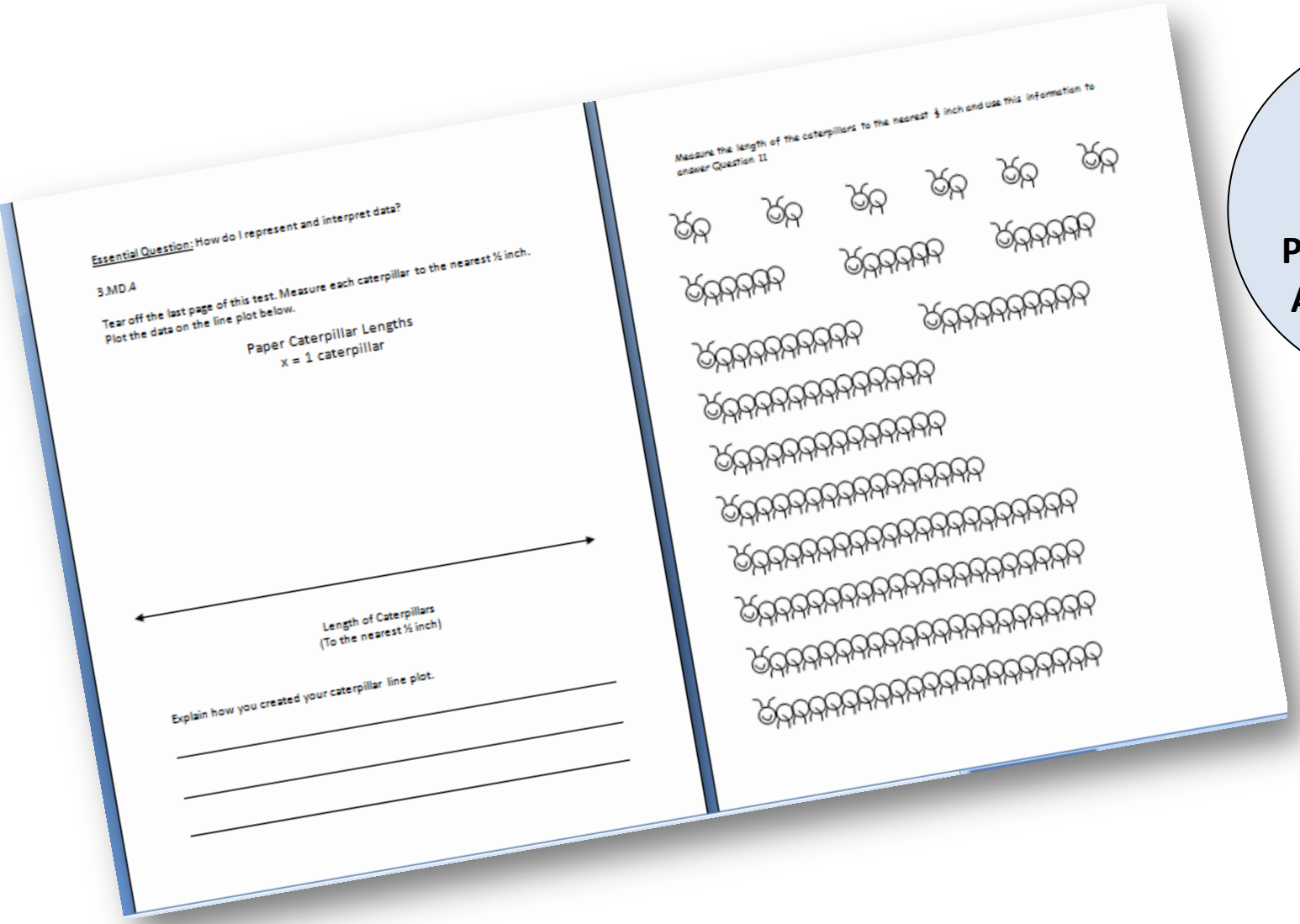
Label the points on the number line with the corresponding fractions. 3.NF.2

0 ___ ___ ___ 1

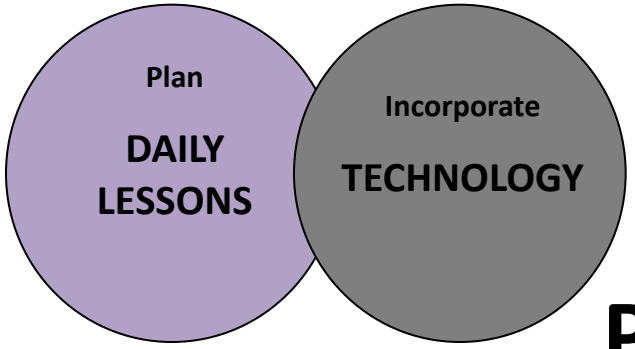
Options for Assessment – available online for Unit 2



Essential Question: How do I represent and interpret data?

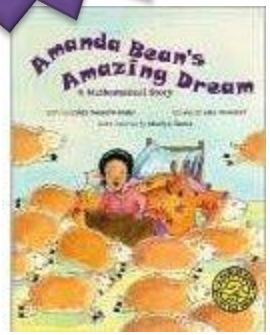


Make or locate SUMMATIVE and PERFORMANCE ASSESSMENTS



Week 1 Possible Lesson

Click on book to hear the story!



Launch

-APK –What's your favorite thing to do at recess?
Picture of kids playing soccer – What are they doing?
-Pose the problem

Students Independently Work

-Students work to solve the problem
-Teacher listens, notices and confers
-Teacher selects strategies to share

Discussion

-Compare and analyze strategies, mathematical understanding, notation, misconceptions, etc.

Amanda Bean's Amazing Dream

Materials: counters, copy of Amanda Bean's Amazing Dream; Cindy Neuschwander

1. After listening to the story, 'Amanda Bean's Amazing Dream' solve the following problems:

   Which has more chairs – 8 rows of 2 chairs or 3 rows of 6 chairs?

   Which has more books - 7 shelves with 4 books on each shelf or 6 shelves with 5 books on each shelf?

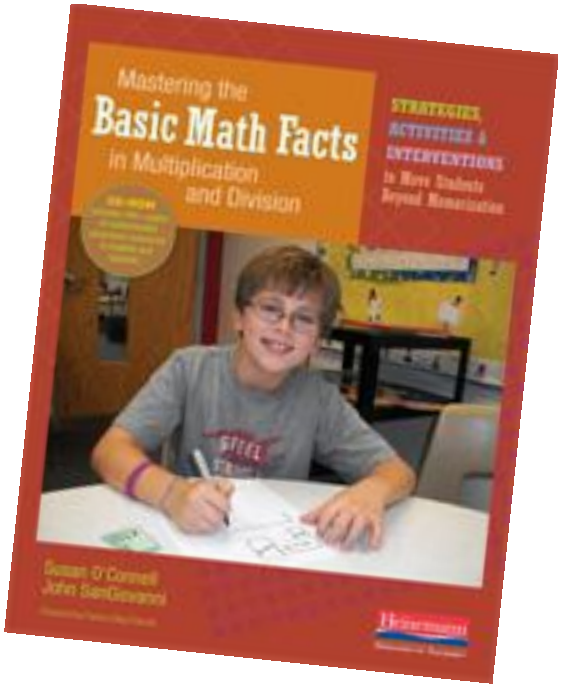
2. Use pictures, numbers or words to explain your thinking.

3. Write and solve your own 'Which has more?' problem.

Online Resource –
K-5mathteachingresources.com
Under Games & Activities

3.OA.3

Week 3
Possible Lesson



Plan
DAILY LESSONS

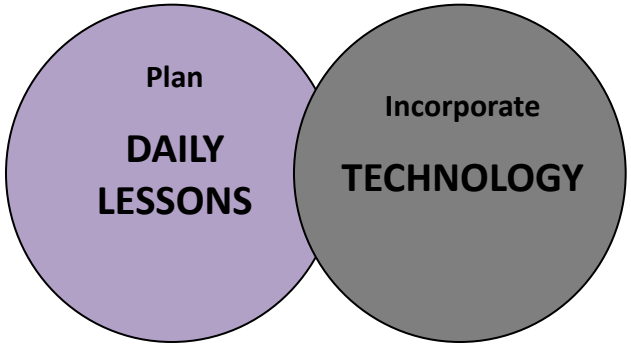
Incorporate
TECHNOLOGY

See full Lesson on Pages 131- 134

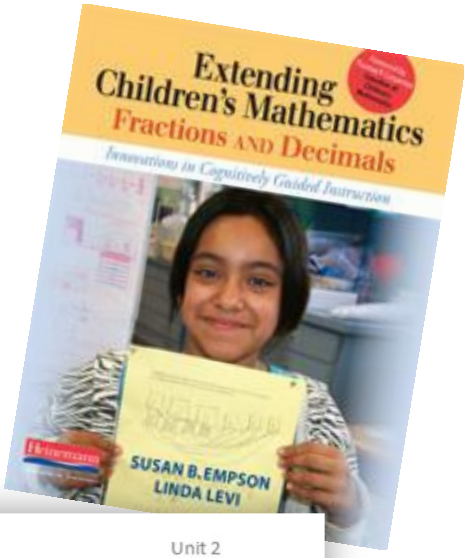
- Read *Cloudy With a Chance of Meatballs* to your class. Click here to listen to the story.
- Give students paper plates to catch their "meatballs" on. Put them in partner pairs, one draws 9 meatballs on their plate, the other draws 10 meatballs.
- Make groups of 9 (i.e. 4 x 9) and groups of 10 (i.e. 4 x 10). Have them compare the products.
- Give them the independent practice page: Plates of Meatballs.
- Have them explore the patterns.
- Debrief what they notice in a whole group discussion.

District Purchased Resource –
Mastering the Basic Math Facts in Multiplication Division

3.OA.7 & 3.OA. 5



Week 5 Possible Lesson



Launch

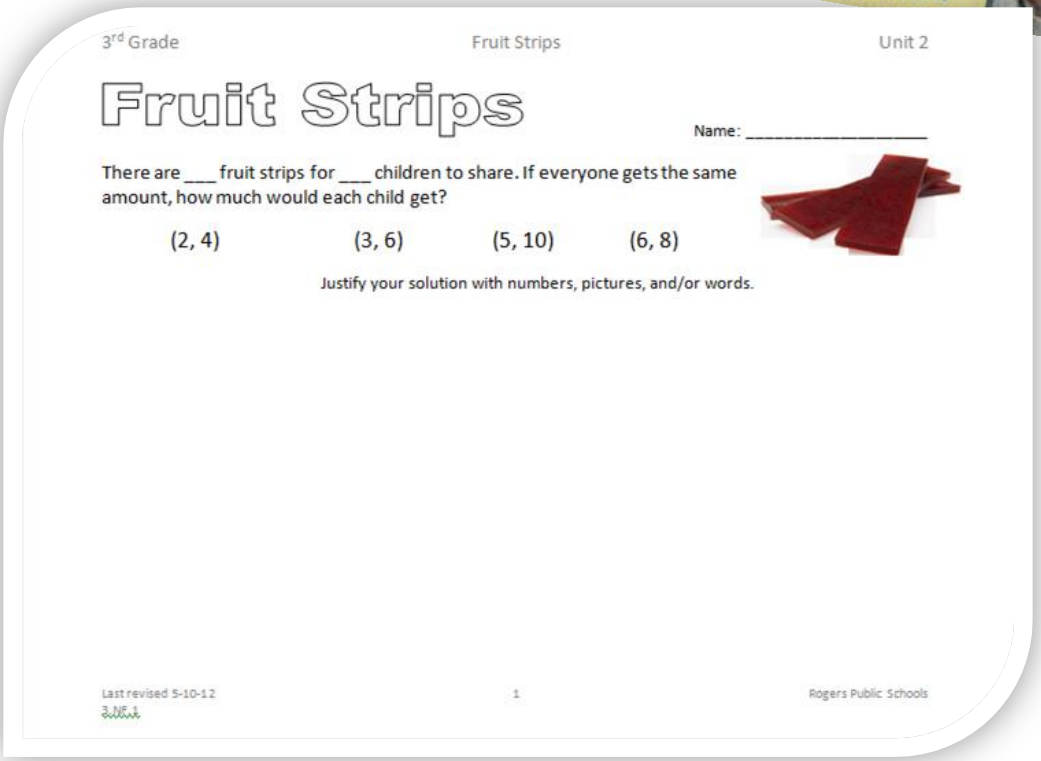
-APK –What's your favorite thing to do at recess?
Picture of kids playing soccer – What are they doing?
-Pose the problem

Students Independently Work

-Students work to solve the problem
-Teacher listens, notices and confers
-Teacher selects strategies to share

Discussion

-Compare and analyze strategies, mathematical understanding, notation, misconceptions, etc.



3rd Grade Fruit Strips Unit 2

Fruit Strips

Name: _____

There are ___ fruit strips for ___ children to share. If everyone gets the same amount, how much would each child get?

(2, 4) (3, 6) (5, 10) (6, 8)

Justify your solution with numbers, pictures, and/or words.

Last revised 5-10-12 1 Rogers Public Schools

3.NF.1

District Purchased Resource –
Extending Children's Mathematics
Fractions and Decimals

3.NF.1 & 3.G.2

Week 8
Possible Lesson

Personal Unit Tape Measure Lesson

Unit 4

Personal Unit Tape Measure

This unit revisits concepts of measurement but in this lesson, the measurement units are not tied to feet, and students are introduced to fractions as partial-units. The goal for students is to create a tape measure composed of "personal" units, and to measure the length of different objects with this personal tape measure. A personal unit is a unit named after each student (e.g., 1 Nina). Personal units are rectangular strips ranging from 1 by 4 inches to 1 x 16 inches. (The long side of the rectangle is what is used to measure length, but its 2-D structure helps students better visualize the results of folds.) The teacher assigns each student one type or personal unit length (perhaps by lottery). Classroom discussion focuses on splitting units, so that lengths that are not multiples of whole numbers can be measured. Fractions, a/b, are quantities representing *a* copies of *b* congruent partitions of the unit. The symbolization a/b corresponds to partitioning the personal unit into b congruent partitions by folding, and then traveling (walking) a of these partitions, starting at the zero. Hence, 1/4 unit represents traveling from the origin, 0, to the end of the first of 4 equal partitions of the unit. Similarly, 3/4 unit represents traveling from the origin to the end of the 3rd of 4 congruent partitions, and 5/4 unit represents traveling from the origin to the end of 5 of these congruent partitions, each of which is 1/4 unit long. An alternative interpretation of a/b is a iterations of 1/bth partition. Hence, 2/4 is 2 iterations of 1/4th.

Materials

- Adding machine tape
- Felt-tip markers
- Glue sticks
- A giant foot (a strip that is 2 feet-long units)
- Identical units: 5 construction paper strips per student and extras for teacher demonstration

Lengths of strips in inches:
1 x 4
1 x 8
1 x 16

(More proficient students should use the shortest units).

In this lesson. . .

Part One: Introducing the Unit – Each student will make a "personal unit tape measure" with 5 personal units, but this time, the goal is to create parts of units so that the measurement will be more accurate.

Part Two: Partitioning Problems – Students work in pairs to solve two different partitioning problems involving one half and then one quarter.

Part Three: Constructing the Tape Measure – Students construct tape measures, label them, and then give them to other students to measure lengths selected by the teacher.

Part Four: What Have We Learned? – An instructional conversation reflects on the problem of how to name partial units.

Plan
DAILY LESSONS

Incorporate
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Find It Here!!

Fractions on Number Lines Resource guide for using Rich Lehrer's Measurement Units (3.NF.2a,b, 3.NF.3a,c)
U4: Personal Unit Tape Measure SMART Notebook Companions: Day 1 Day 2
U5: Thinking About Scale SMART Notebook Companion: Thinking About Scale
U6: Compositions and Equivalence with Standard Units
Walk-A-Thon Fractions on a Number Line SMART lesson

Online Resource –
Fractions on a Number Line
U4: Personal Unit Tape Measure

3.NF.2

NEW Teacher Created Resources pages!!!

RESOURCES

Beth Pesnell
Elementary Curriculum Specialist
bpesnell@rps.k12.ar.us