

Copy, Change, Flip?

Why not to invert and multiply

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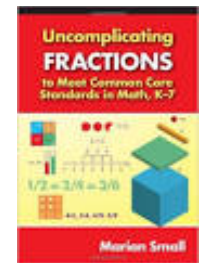
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Resources used for this presentation

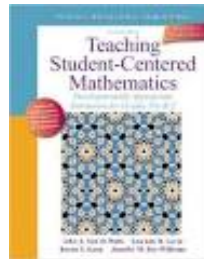
- *Beyond Invert & Multiply*
By Julie McNamara



- *Uncomplicating Fractions*
By Marian Small



- *Teaching Student-Centered Mathematics*
By John Van de Walle



- *Putting Essential Understanding of Fractions into Practice in Grades 3-5*
By NCTM



- Thank you ETA, Hand 2 Mind for providing manipulatives for this presentation.

Over or Under?

$\frac{7}{15} + \frac{5}{12} + \frac{9}{20}$	$\frac{3}{7} + \frac{5}{9} + \frac{2}{3} + \frac{7}{8} + \frac{5}{12}$
Over 2 Under 2	Over 4 Under 4
$\frac{41}{80} + \frac{1}{2} + \frac{19}{20} + \frac{4}{9}$	$4\frac{3}{5} + 5\frac{2}{3} + 1\frac{7}{12}$
Over 3 Under 3	Over 11 Under 11

6.NS.1 - Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?

- I can use division of fractions to solve real world problems.

Where to begin?

Types of Division

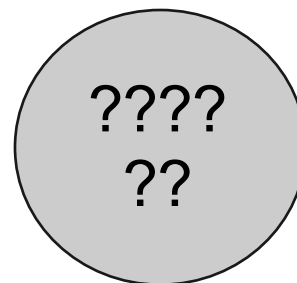
Partitive (sharing division):

Number of groups is known; how many in each group is unknown

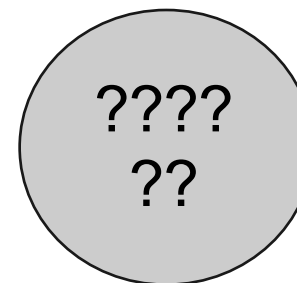
Ask “How many in each group?”

$6 \div 2$: Split 6 into 2 equal groups - How many are in each group?

How many in each group?



Group 1



Group 2

Partitive Division

Where to begin?

Types of Division

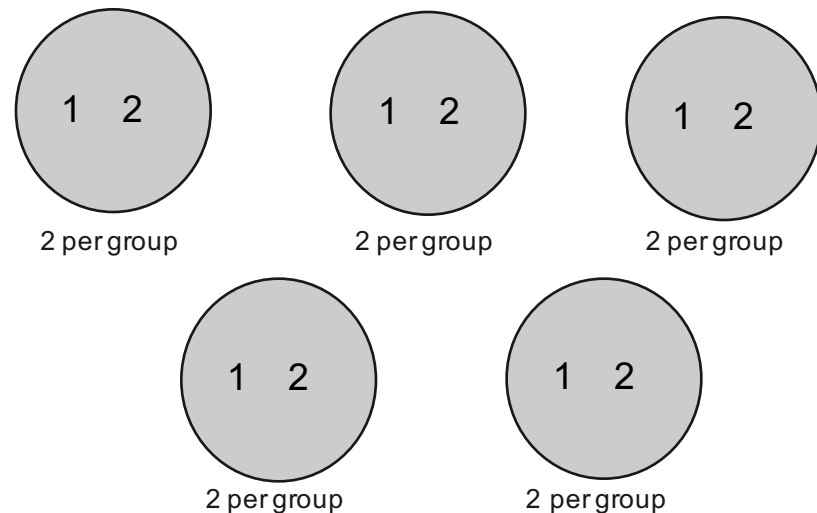
Quotative (measurement division):

How many belong in each group is known, but how many groups is unknown.

Ask “How many groups?”

$6 \div 2$: How many groups of 2 are in 6?

How many groups?



Quotative Division

Where to begin?

Whole Number Division

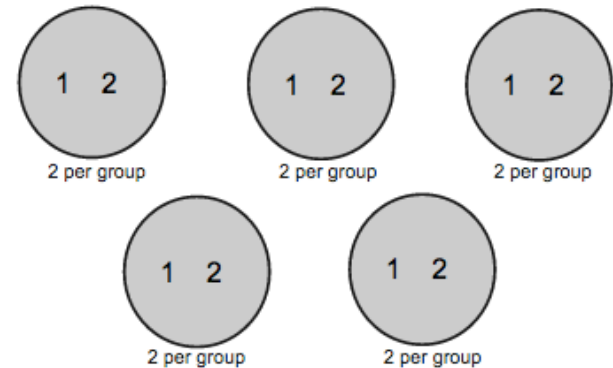
Mr. Vargis is able to complete 8 conferences each day. If he does 48 conferences in all how many days will he need to complete his conferences?

There were 30 stickers left. If each person will receive 3, how many people get stickers?

24 apples for 4 friends.
How many did each friend get if each gets the same amount?

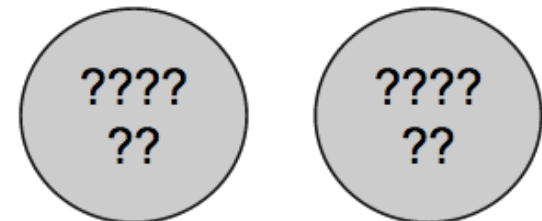
There were 72 students on 12 busses. Each bus has the same amount of students. How many on each bus?

How many groups?



QUOTATIVE DIVISION

How many in each group?



Group 1

Group 2

PARTITIVE DIVISION

Where to begin?

Whole Number Division

Mr. Vargis is able to complete 8 conferences each day. If he does 48 conferences in all how many days will he need to complete his conferences?

Quotative/Measurement - How many 8s are in 48? The number of 8s in 48 are the number of days it takes to complete his conferences.

There were 30 stickers left. If each person will receive 3, how many people get stickers?

Quotative/Measurement - How many 3s are in 30?

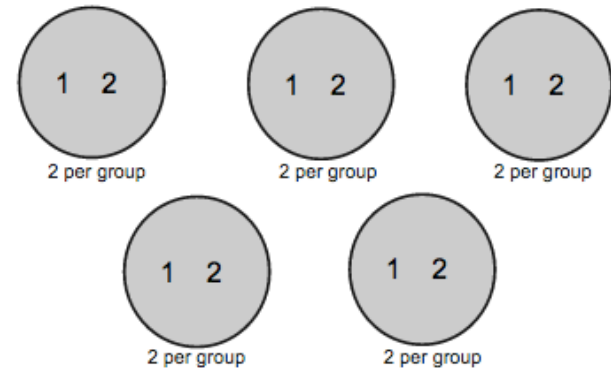
24 apples for 4 friends. How many did each friend get if each get the same amount?

Partitive - Split 24 into 4 groups. The number in each group is the number that each friend received.

There were 72 students on 12 busses. Each bus has the same amount of students. How many on each bus?

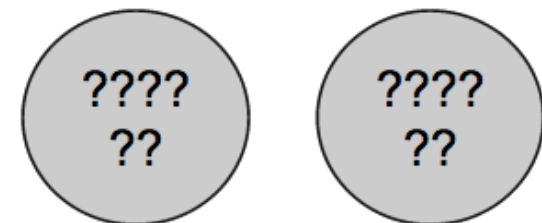
Partitive - Split 72 into 12 groups. The number in each group is the number of students.

How many groups?



QUOTATIVE DIVISION

How many in each group?



Group 1

Group 2

PARTITIVE DIVISION

How far? How long?

Roadside Clean-Up (2 people)

Distance	Each Person Cleans
8 miles	4 miles
4 miles	2 miles
2 miles	1 mile
1 mile	$\frac{1}{2}$ mile
$\frac{1}{2}$ mile	?
$\frac{1}{4}$ mile	?

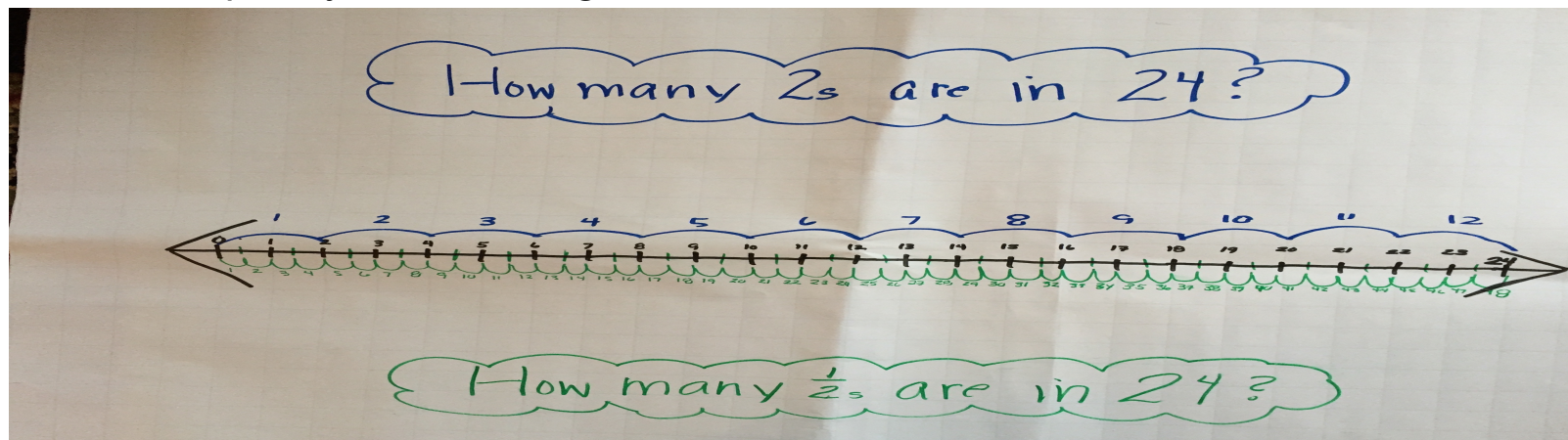
*Adapted From Math Solutions/Julie McNamara presentation

Think about it...

Is $24 \div 2$ the same as $24 \div \frac{1}{2}$?

At your table discuss each problem.

Model and explain your reasoning.

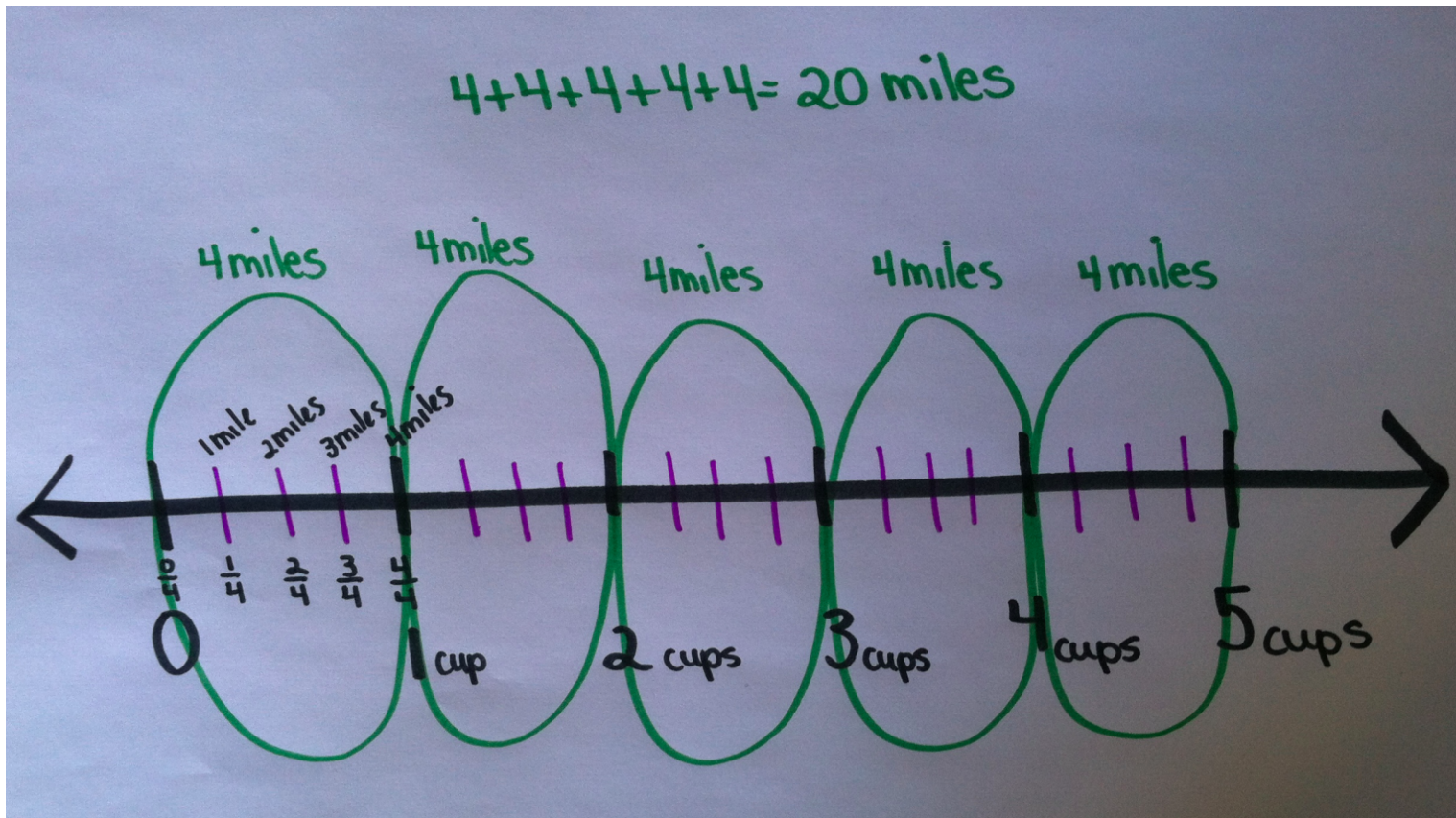


Whole Number \div Unit Fraction

Sheila drinks $\frac{1}{4}$ of a cup of water for every mile hiked. Her bottle holds 5 cups of water. How far can she hike before her water runs out?



- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.



On an open number line

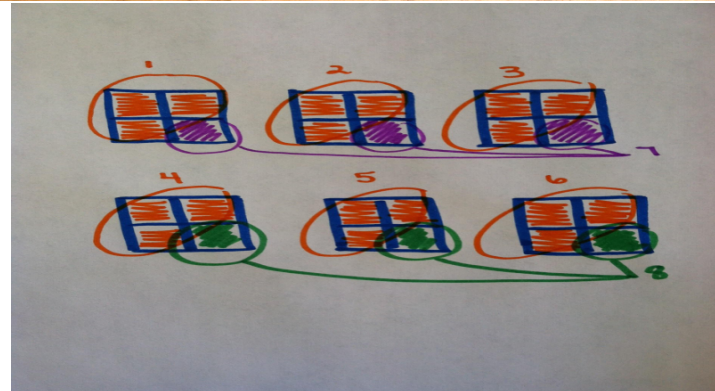
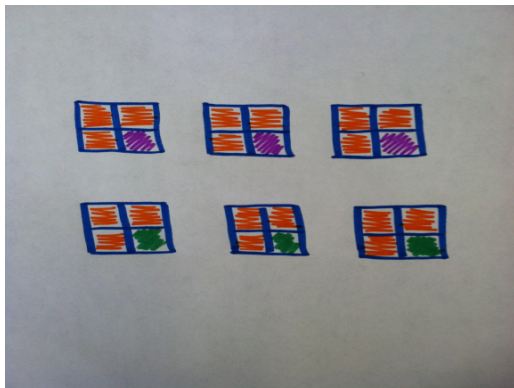
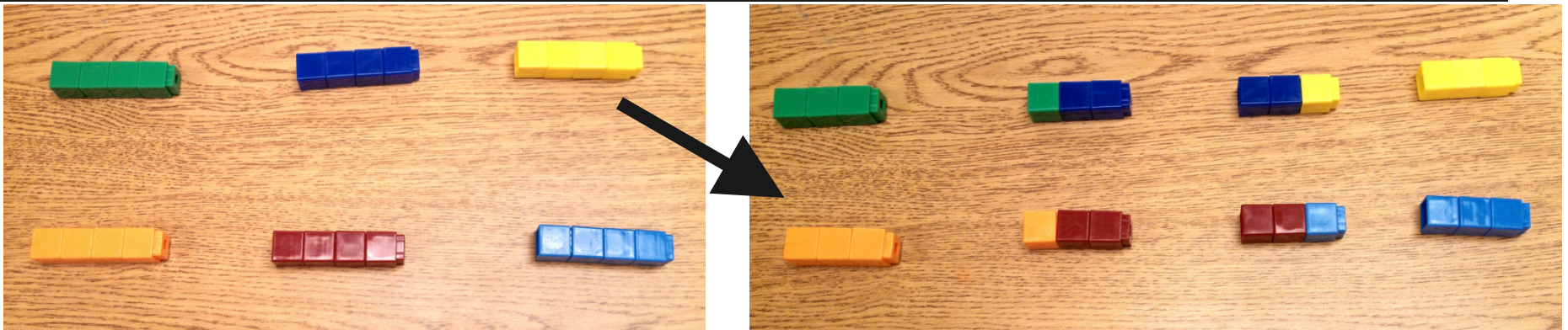
Whole Number \div Fraction

For the birthday party you buy 6 containers of ice cream. You serve $\frac{3}{4}$ of the carton to each guest. How many guests can be served?



- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.

With manipulatives and Visual Models



Fraction or Mixed Number \div Whole Number

Cameron and his 3 friends are sharing $\frac{1}{3}$ of his leftover birthday cake. How much of the total cake will each person receive?

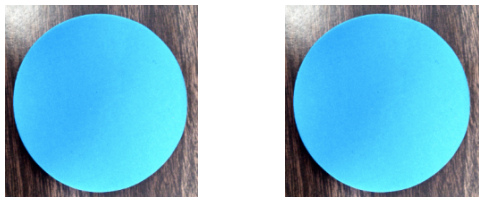
Mark has $1\frac{1}{4}$ hours to finish three chores. If divided evenly, how much time will he spend on each chore?

Cassie has $5\frac{1}{3}$ yards of ribbon to make 4 bows. How much ribbon is used for each bow if each uses an equal amount?

A turtle walked $\frac{2}{3}$ of a mile over 4 days. He walked an equal distance each day. How far did he walk each day?

Fraction \div Fraction

A serving is $\frac{1}{2}$ cookie. How many servings can I make from 2 cookies?



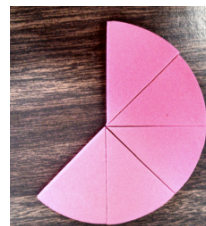
A serving is $\frac{1}{2}$ cookie. How many servings can I make from $\frac{3}{4}$ cookie?



A serving is $\frac{1}{2}$ cookie. How many servings can I make from $\frac{3}{8}$ cookie?



A serving is $\frac{1}{2}$ cookie. How many servings can I make from $\frac{5}{8}$ cookie?



Unit Fraction ÷ Unit Fraction

A pizza is divided into 8ths. Half is left. How many 8ths are left?
Solve this without using invert and multiply.

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



- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.

Fraction \div Fraction

Diana is building a birdhouse. She has $\frac{9}{16}$ of a piece of plywood remaining. Each birdhouse requires $\frac{3}{4}$ of a piece of plywood. Does she have enough to make a birdhouse? Prove it.

$$\frac{9}{16} \div \frac{3}{4}$$



- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.

Fraction \div Fraction

John has $5\frac{1}{4}$ yards of tape. He needs $1\frac{1}{4}$ yards of tape to hang all of the Science Practice posters in an elementary school. In how many schools can John hang the posters? Will there be any tape left over?



- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.

Final thoughts

Things to Remember

- **Use problems in context**
- Have students provide a context for an equation
- Start with division of whole numbers
- Look for patterns
- Continue use of manipulatives & visuals
- Build conceptual understanding **first**
- Avoid Copy - Change - Flip!

Thoughts to Guide Problem Solving

- What do we know about the problem that will help you solve?
- What are we trying to find out?
- Solve using a visual representation – pictorial, number line, etc.



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