A close-up photograph of a pencil and a pen resting on a sheet of graph paper. The pencil is in the foreground, pointing towards the right. The pen is behind it, also pointing right. The background is a soft-focus grid of graph paper.

EUREKA MATHEMATICAL MODELS AND STRATEGIES

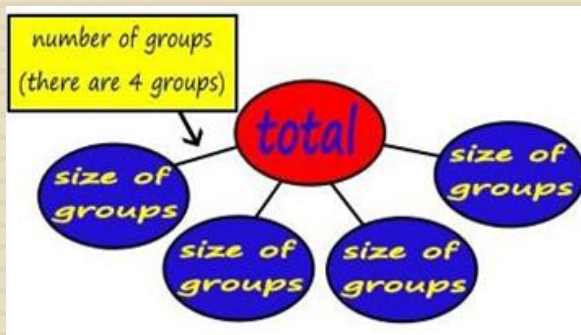
THIRD GRADE

Rio Rancho Public Schools

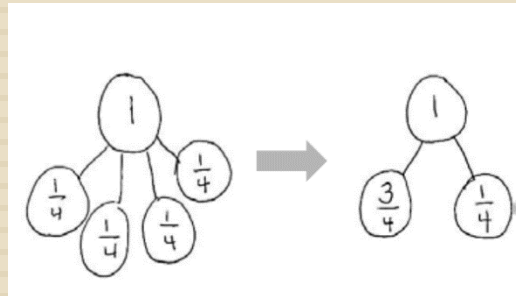
Number Bonds

Number bonds help students see that numbers can be “broken” into pieces or *parts* to make computation easier. With number bonds, students recognize the relationship between numbers through a written model that shows how the numbers relate. Number bonds are a visual representation of the part-part-whole relationship where the smaller numbers (the parts) make up larger numbers (the whole).

Multiplication



Fractions



Measurement

Handwritten work for a measurement problem. It shows the equation $34g + 126g = ?$. A blue checkmark is drawn above the numbers. Below the equation, the calculation is shown: $30 + 4 + 126 =$ followed by $30 + 130 = 160g$.








<http://greatminds.net/maps/math/video-gallery/representing-fractions-using-number-bonds>







Place Value Charts

A **place value chart** is a graphic organizer that helps students understand the value of a digit.

Solve using a place value chart

Sabrina had 726 milliliters of water when she started her hiking trip. She has 182 milliliters of water after her hiking trip. How many milliliters of water did Sabrina drink?

| $726 - 182 = \underline{\quad}$ | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| hundreds | tens | ones |
|    |   |   |
| 7 | 2 | 6 |

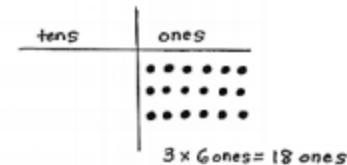
| $726 - 182 = \underline{\quad}$ | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| hundreds | tens | ones |
|    |   |  |
| 5 | 4 | 4 |

Start with the ones. Can 2 ones be taken away from 6 ones? Yes, 6 ones - 2 ones = 4 ones. Move to the tens, can 8 tens be taken away from 2 tens? No! There are not enough tens to subtract so unbundle 1 hundred and create 10 tens. Now there are 12 tens. 12 tens - 8 tens = 4 tens. Can 1 hundred be taken away from 6 hundreds? Yes 6 hundreds - 1 hundred = 5 hundreds.

Sabrina drank 544 mL of water on her hiking trip.

Multiplication with Multiples of Ten

Image A



$$\begin{aligned}
 &(3 \times 6 \text{ ones}) \times 10 \\
 &= 18 \text{ ones} \times 10 \\
 &= 18 \text{ tens} \\
 &= 180
 \end{aligned}$$

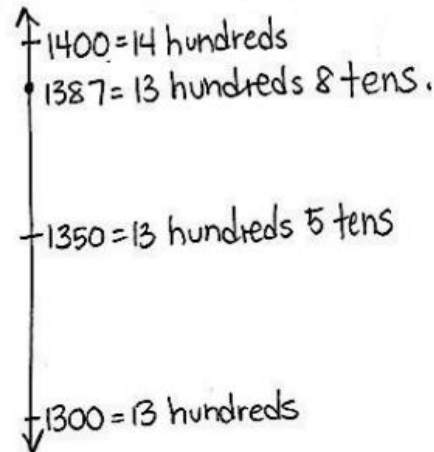
This video shows how to use a place value chart (chip model) for addition, subtraction, multiplication, and division.

<https://vimeo.com/71596082>

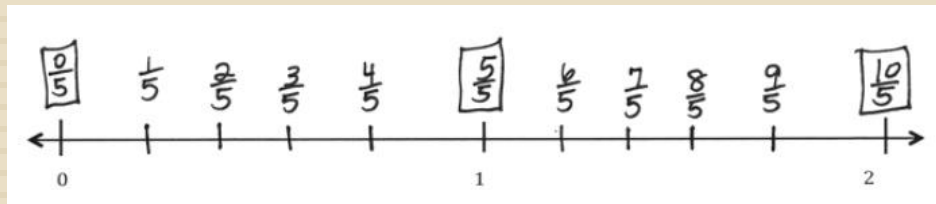
Number Lines

The **number line** is used to develop a deeper understanding of whole number units, fraction units, and measurement units.

Round 1,387 to the nearest hundred using a vertical number line. (whole number units)

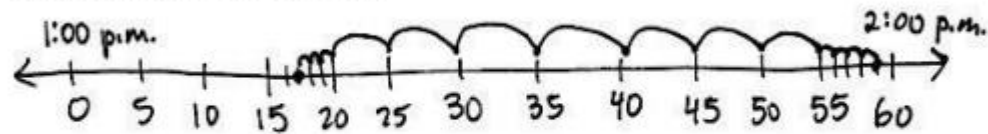


Fraction Units



Elapsed Time (measurement)

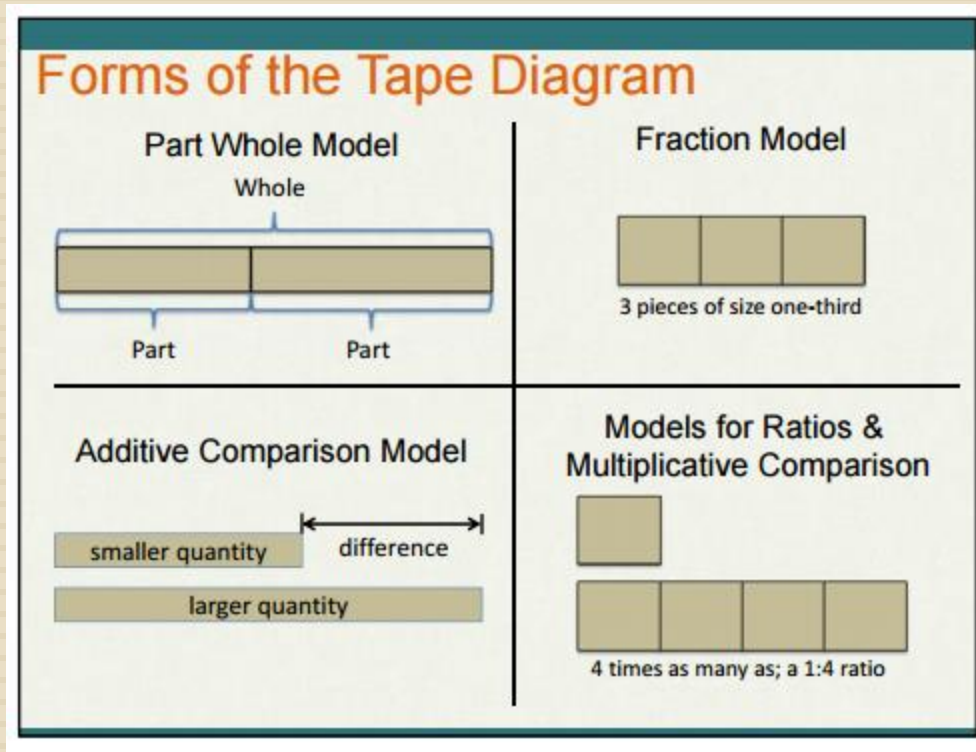
The third grade chorus performs a musical for the school. The musical lasts 42 minutes. It ends at 1:59 p.m. What time did the musical start?



The musical starts at 1:17 p.m.

Tape Diagrams

Tape diagrams are pictorial representations of relationships between quantities.



Read, Draw, Write (RDW)

RDW is a process that mathematicians and teachers use for problem solving.

- 1) Read.
- 2) Draw and Label using a tape diagram or bar model.
- 3) Write a number sentence (equation).
- 4) Write a word sentence (statement).

Draw a Tape Diagram to Solve

Tammy went to the fruit stand. She bought 682 grams strawberries on Monday. On Tuesday she buys 273 grams of strawberries. How many more strawberries did Tammy buy on Monday than on Tuesday?

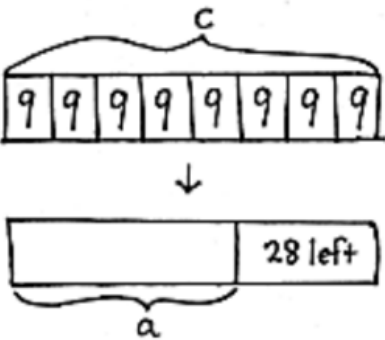
$$\begin{array}{r} 682 \\ - 273 \\ \hline 409 \end{array}$$

Tammy bought 409 g more strawberries on Monday than on Tuesday.

Tape Diagrams

In Third Grade students use **tape diagrams** to model simple word problems involving the four operations (multiplication, division, addition and subtraction).

Asmir buys 8 boxes of 9 candles for his dad's birthday. After putting some candles on the cake, there are candles left. How many candles does Asmir use?



$8 \times 9 = c$
 $c = 72$

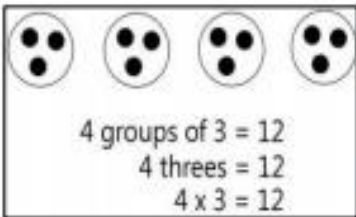
$72 - 28 = a$
 $a = 44$
Asmir used 44 candles.

<https://www.engageny.org/resource/word-problems-with-tape-diagrams>

Multiplication and Division-Equal Groups

When groups are equal they have the same number of items in each. This is often the first meaning for multiplication and is calculated by “repeated addition”.

Example Multiplication Problem

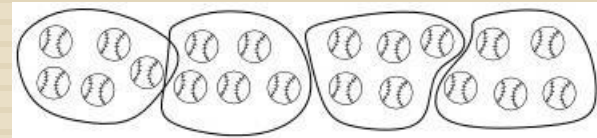


The size of each group is 3, because there are 3 circles in each group. (In the repeated addition sentence 3 is the number repeated)

Example Division Problem

Students are introduced to division as an unknown factor problem. They will learn to see division as a way to find out how many groups or the size of each group.

Tracy puts 20 baseballs into bags. Each bag holds 5 balls. Circle the groups of 5 to show the balls in each bag.

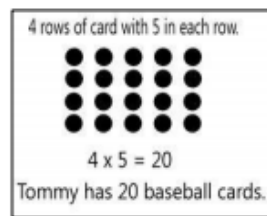


Multiplication and Division-Arrays

An arrangement of objects, pictures, or numbers in columns and rows is called an **array**. Arrays are useful representations for multiplication and division.

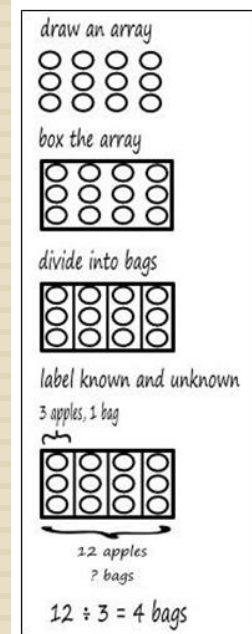
Example Multiplication Problem

Tommy collects baseball cards. He arranges them in 4 rows of 5. Draw Tommy's array to show how many baseball cards he has all together. Then write a multiplication sentence to describe the array.



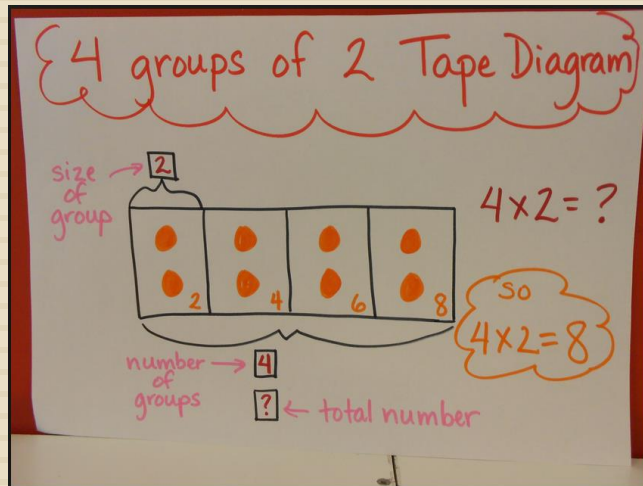
Example Division Problem

Ms. Cara has 12 apples. She puts 3 apples in each bag. How many bags does she have?



Multiplication and Division-Tape Diagrams

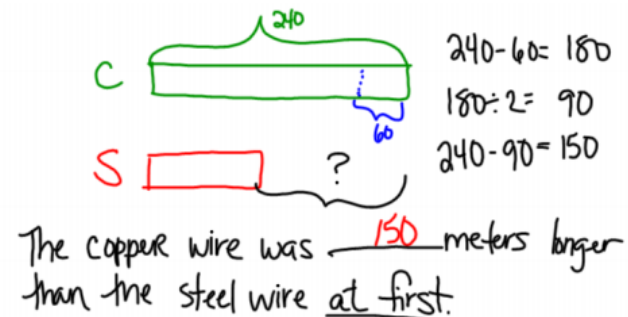
Multiplication



<http://www.showme.com/sh/?h=ZLGeQmO>

Division

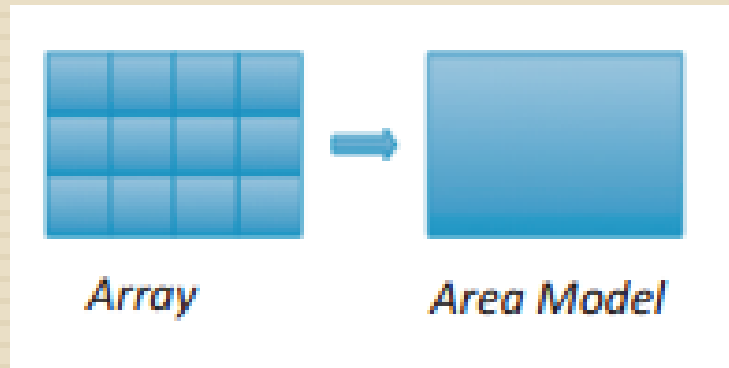
A copper wire was 240 m long. After 60 m was cut off, it was double the length of a steel wire. How much longer was the copper wire than the steel wire at first?



<http://www.cleanvideosearch.com/media/action/yt/watch?v=OIC1UiPn9kQ>

Multiplication-Area

In Third Grade, students begin to explore **area** with hands on manipulatives. They see the connection between an array and area. This supports the understanding of we calculate length times width as $l \times w = a$.

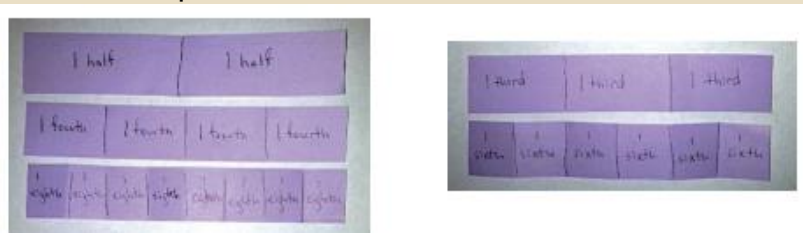


<https://learnzillion.com/lessons/343-find-the-area-of-a-rectangle-using-arrays>

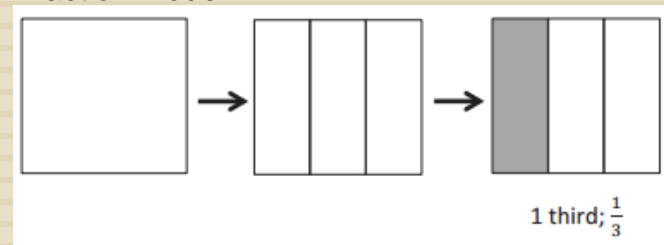
Fractions

Students learn about **fractions** by partitioning a whole into equal parts. Students will work with visual models to support their understanding of fractions.

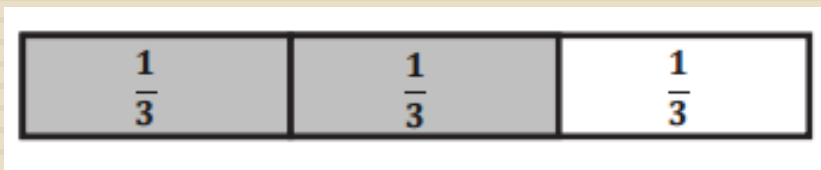
Fraction Strips



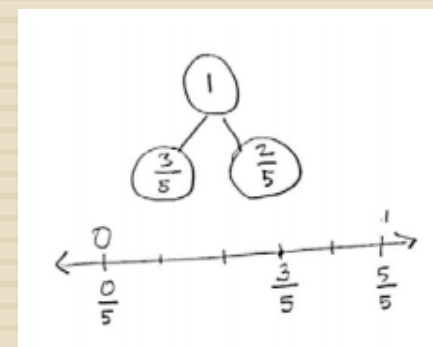
Fraction Model



Fraction Strip labeled with Unit Fractions



Number Line



Thank You to the following teachers and instructional coaches for collaborating on this project.

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