

DELTA MATH SCIENCE PARTNERSHIP INITIATIVE

M³ Summer Institutes

(Math, Middle School, MS Common Core)

Introduction to Fractions

Hook Problem: How can you share 4 pizzas among 6 people?

Final Answer:

Goals: Show examples where the whole is more than one unit, less than one unit, and exactly one unit.

Introduction to Cuisenaire Rods:

Dump out your collection of Cuisenaire rods and play with them for a few minutes, in any way that occurs to you. (No matter what grade level you teach, allow students to begin with the rods in this way.)

Once you've played with them for a few minutes, arrange the pieces in order of size, smallest to largest. List the smallest first.

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Answer the following questions:

- Which piece is one unit smaller than the blue piece?
- Which piece is three units larger than the yellow piece?
- Which piece is four units less than the yellow pieces?
- Which piece is the same size as two purple pieces?
- What piece can be added to the light green piece to make it the same size as the blue piece?
- Is there more than one way to represent each size?

True or False, and if false write the true statement associated with it.

a. $y + d > o$

A: _____

b. $w + k = n$

A: _____

c. $g + r < p$

A: _____

d. $o + r = d + d$

A: _____

e. $3 \times g > e$

A: _____

f. $r + y = p + g$

A: _____

g. $2 \times e = 3 \times d$

A: _____

h. $y + y = o$

A: _____

i. $p + y > k + r$

A: _____

j. $g + d < e$

A: _____

Can you make some true or false statements?

Multiples

- a. What piece is twice as long as the red piece?
- b. What piece is five times as long as the white piece?
- c. What piece is three times as long as the light green piece?
- d. What piece is four times as long as the red piece?
- e. The orange piece is twice as long as what piece?
- f. The dark green piece is three times as long as what piece?
- g. What piece must be added to the orange to make it twice as long as the black piece?
- h. What pieces are multiple of the red piece? (Don't forget the red piece itself!)
- i. What pieces are multiples of the light green piece?
- j. Is there any piece which is a multiple of both the red and light green pieces?
- k. Is there any piece which is a multiple of both the red and light green pieces?

Fractional parts

- a. What piece is half of the orange piece?
- b. What piece is one-third of the blue piece?
- c. What piece is one-fourth of the brown piece?
- d. The light green piece is half of what piece?
- e. The white piece is one-fifth of what piece?
- f. The red piece is one third of what piece?
- g. What piece is one-third as long as the orange and red pieces put together?
- h. What piece is one third as long as two orange and white pieces put together?
- i. What piece is one-half of the sum of the blue and yellow pieces?
- j. What piece is twice as long as one-third of the blue piece?
- k. What piece is half as long as one-third of the dark green piece?
- l. What piece is three-fourths of the brown piece?
- m. What piece is three-sevenths of the black piece?
- n. Add the orange and red pieces together. What piece is two-thirds of this length?
- o. The dark green piece is two-thirds of what piece?
- p. The red piece is two-fifths of what piece?
- q. The light green piece is three-fourths of what piece?
- r. The yellow piece is five-eighths of what piece?

- s. The purple piece is two-thirds of what piece?
- t. The purple piece is four-thirds of what piece?
- u. What piece is two-thirds of the light green piece?
- v. The red piece is what fractional part of the light green piece?
- w. The light green piece is what fractional part of the purple piece?
- x. The light green piece is what fractional part of the yellow piece?

The purple piece is what fractional of

- a. the brown piece?
- b. The dark green piece?
- c. The yellow piece?
- d. The orange piece?

Add two oranges and a white.

- a. what piece is one-third of this length?
- b. What piece is one-seventh of this length?
- c. What piece is three-sevenths of this length?

Add two oranges and purple.

- a. what piece is one-third of this length?
- b. What piece is one-fourth of this length?
- c. What piece is one-sixth of this length?
- d. What piece is one-eighth of this length?

- e. What can be added to the brown piece to make it one-half of this length?
- f. What piece is five-twelfths of this length?
- g. Which is bigger, two-thirds of this length or four-sixth of it?

Add a light green and a red piece. This length is what fractional part of the orange piece?

Add a purple and a red piece. This length is what fractional part of

- a. the blue piece? _____
- b. The brown piece? _____
- c. The orange piece? _____

Addition and Subtraction

a. $r + y =$

g. $_ + e = o$

b. $b + g =$

h. $_ - e = w$

c. $e - r =$

i. $d + g = p + _$

d. $n - d =$

j. $n + _ = o + d$

e. $w + _ = y$

k. $e - d = _ + w$

f. $o - _ = g$

l. $(o + e) - _ = b + n$

Make up some addition and subtraction problems of your own.

Addition, Subtraction, and Multiplication

a. $r \times g =$

b. $r \times p =$

c. $p \times g = o + \underline{\quad}$

d. $p \times r = \underline{\quad}$

e. $g \times d = \underline{\quad}$

f. $g \times p = \underline{\quad} + r$

g. $y \times p = o + \underline{\quad}$

h. $(w + r) \times y = o + \underline{\quad}$

i. $(w \times y) + (r \times y) = \underline{\quad}$

j. $g \times \underline{\quad} = o + y$

k. $\underline{\quad} \times r = o$

l. $p \times g = d + \underline{\quad}$

Make up some multiplication problems of your own.

Division

a. $d \div r = \underline{\quad}$

b. $n \div p = \underline{\quad}$

c. $o \div r = \underline{\quad}$

d. $b \div w = \underline{\quad}$

e. $y \div y = \underline{\quad}$

f. $y \div r = \underline{\quad}$

g. $e \div p = \underline{\quad}$

h. $b \div p = \underline{\quad}$

i. $n \div y = \underline{\quad}$

j. $o \div g = \underline{\quad}$

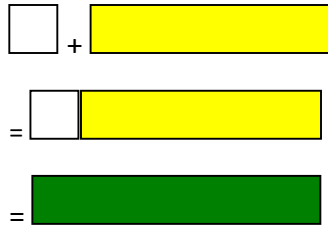
k. $y \div g = \underline{\quad}$

l. $(o + r) \div g = \underline{\quad}$

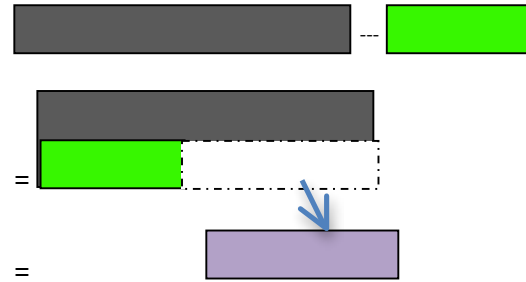
As you work through these examples, part of the problem solving has already been accomplished. More specifically, I have made the decision as to what the “one” rod will be. When one does this with students, the first step is to work them through the exercises specifying which piece should be “one.” At this time, it is careful to watch how they will express any remainders in the division exercises. In any case, the teacher’s line of questioning must be very carefully considered.



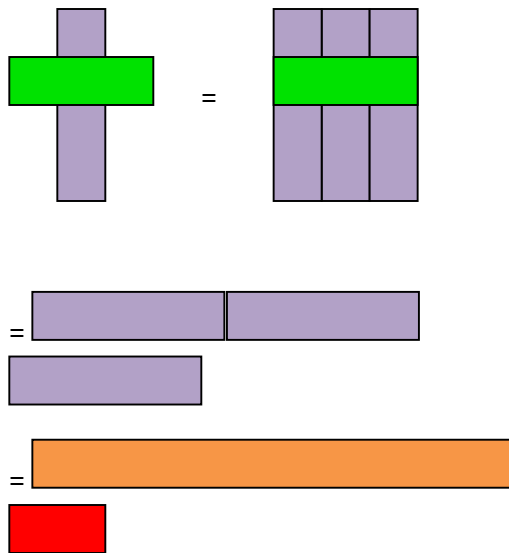
Addition



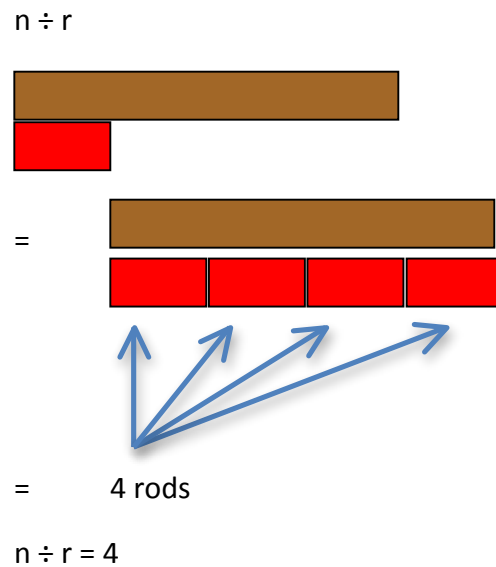
Subtraction



Multiplication



Division



More Questions

1. Predict how many orange rods it will take to make a line across a table.
2. Decide how many yellow rods it will take without measuring.
3. Write down and explain your answer and how you arrived at that answer.

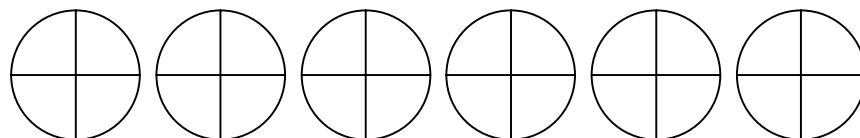
Introduction to Pattern Blocks

Fraction activities 1 through 5. (Turn to your "Fractions" handout in your notebook.)

Teacher Model: How can you share 6 medium pizzas with 4 people?

Strategy 1: Split it all (cut each pizza into 4ths).

Strategy 2: Benchmarking (split each whole and deal with those parts).



Whole collection

24 set model: make 4 subsets (these numbers were in circles.)

1,5,9,13,17,21

10,14,18,22,26

11,15,19,23,37

48, 16,20,12,24

Guiding Question: How much of **one** pizza (single pizza as one unit) does each person get?
How much of the total pizza does each person get? (reference unit) Describe the size of one person's share in relation to the entire original amount of pizza (6 pizzas).

Peanuts

By Charles Schulz



Problems for Participants:

1. How could you share 7 pizzas fairly among 3 people? Draw and model representatives of each situation.

2. In a class of 25 students, 40% play a musical instrument. What part of the class plays a musical instrument?

3. Suppose you have 170 cookies to share among 13 people. How many will each person get?

4. It takes $\frac{2}{5}$ of a banana to cover a graham cracker. You have 3 bananas. How many graham crackers can you cover in banana?

5. It takes a submarine 20 seconds to drop from the surface to 100 feet below sea level. What is the rate of descent?

6. Discuss the “Hook Problem” with other teachers and demonstrate unique solutions and thought processes.
7. Identify Common Core State Standards.
8. Identify mathematical practices and tell why you chose what you did.