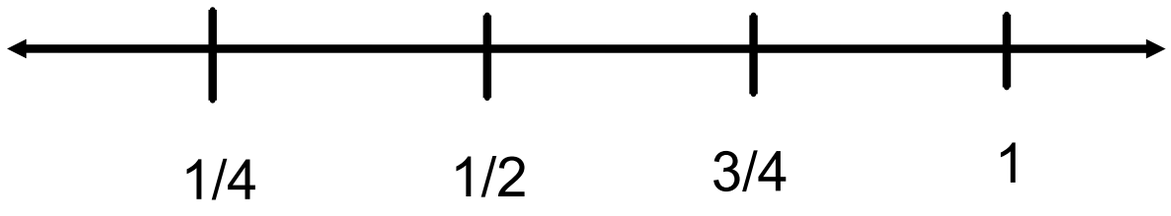
Fractions and Decimals

Whole Numbers are Not Enough!!!

- **Need to describe continuous quantities where an amount between two whole numbers needs to be specified and communicated**
- **Need for inventing smaller units led to a systematic approach to measuring more precisely extended the number system itself to include common fractions and decimal fractions**



Fractions or Decimals??

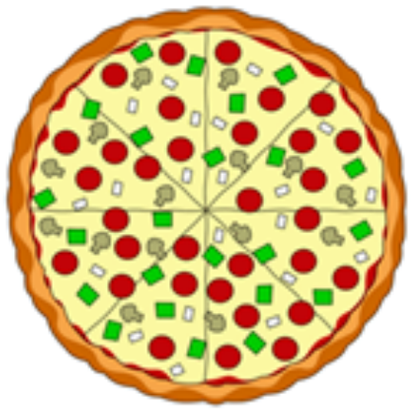
- **Both fractions and decimals serve the same purpose of describing parts of a whole**
- **The idea of fractions is more basic**
- **Fraction concept of a tenth is required to understand decimals**

CONTEXT MATTERS…

A school has to pick teams of three people to represent it at the district sports carnival. Seventeen children are available to play. How many teams can the school enter?

Seventeen metres of ribbon are to be used to decorate three identical banners. How much can be used on each?

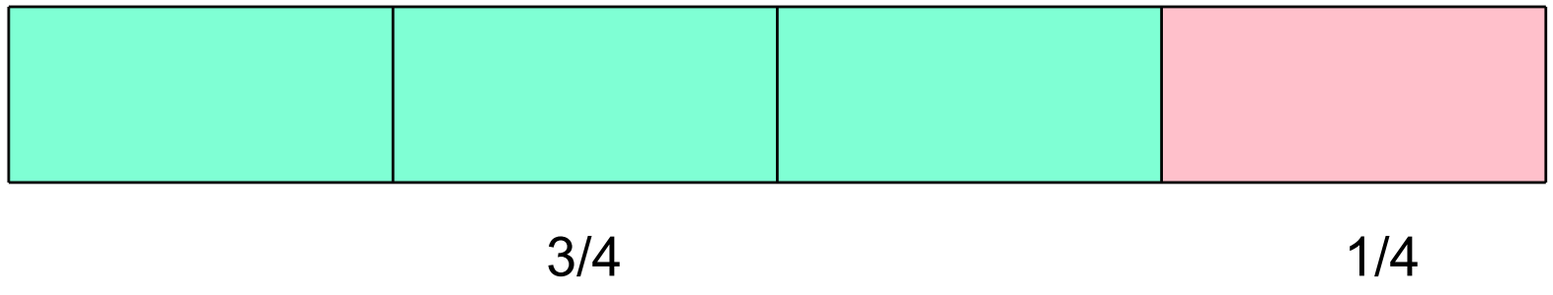
Seventeen pizzas are to be divided equally amongst three basketball teams. How much will each one get?



BIG IDEAS OF FRACTIONS

1) A fraction is not meaningful without knowing what the whole is.

2) There are always two fractions involved in any single fraction situation; the part you are considering and the rest of the whole (e.g., whenever there is ¾, there has to be a ¼).



OAME Gazette, OAME/AOEM Abacus, September 2009

3. There are different interpretations of fractions …

PART-WHOLE

3/5 indicates that the whole has been partitioned into 5 equal parts and 3 of those parts are being considered.

DIVISION

When a fraction is considered a quotient.

(e.g., 3/5 = 3 ÷ 5 OR 6/2 = 6 ÷ 2)

There are 6 cookies shared among 2 children. How many cookies does each child get?

OR

6 cookies are divided up so that there are 2 cookies to a bag. How many bags are needed?

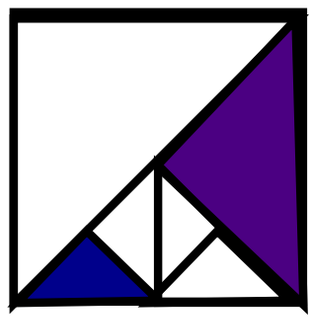
PROBABILITY

1 out of 3 times

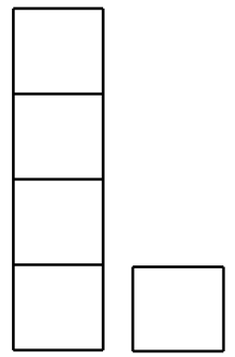
Hatfield, Mary M., Edwards, Nancy Tanner, & Bitter, Gary G. (1997). Mathematics methods for elementary and middle school teachers: Third edition. Toronto: Allyn and Bacon.

SET

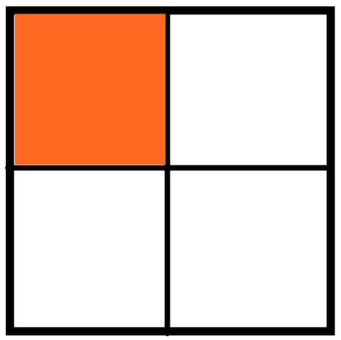
PART-WHOLE (AREA)



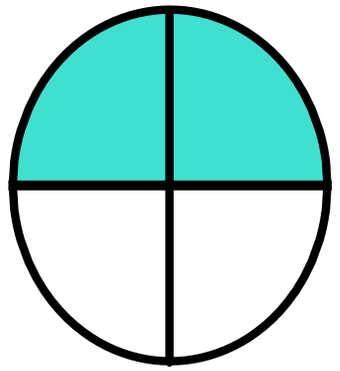
MEASURE



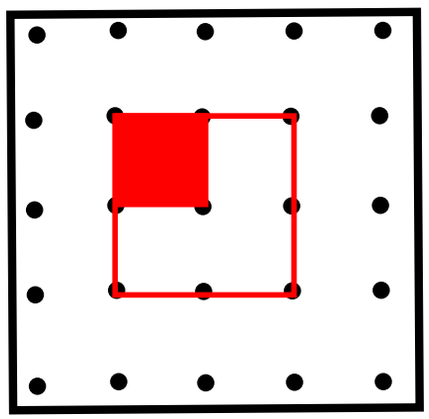
PART-WHOLE (REGION)



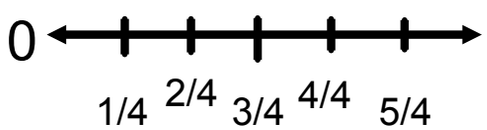
PART-WHOLE (REGION)



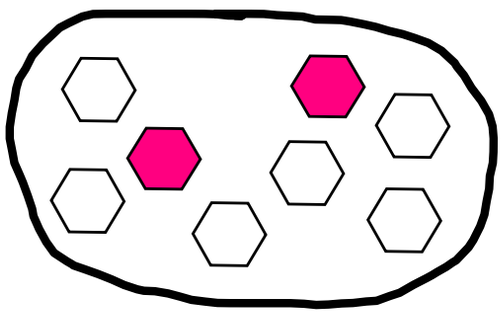
PART-WHOLE (REGION)



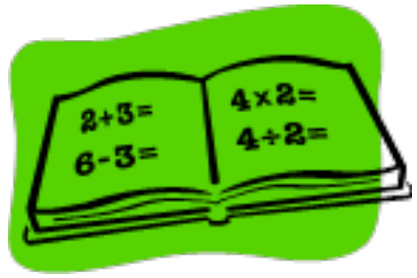
MEASURE



SET



November 30, 2016

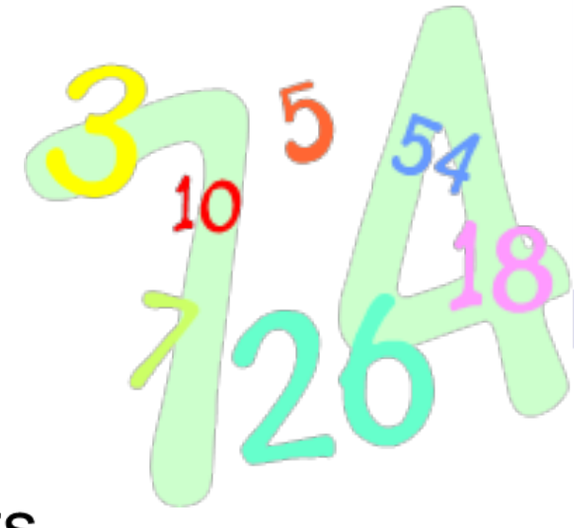


INTRODUCING FRACTIONS

<u>INSTRUCTIONAL APPROACH</u>

CONCRETE→REPRESENTATIONAL→ABSTRACT

A) PARTITIONING



- **BIG Ideas:**

  Equal parts are involved

  Number of parts, names the parts

  As the number of parts of the given whole are increased, the size of the parts (or shares) gets smaller

- introduce halves, thirds, fourths etc. using examples **AND** non-examples
- practice counting parts
- introduce symbol & written words
- students draw own models

FRACTIONS

CONCEPTUAL MODEL

2/3

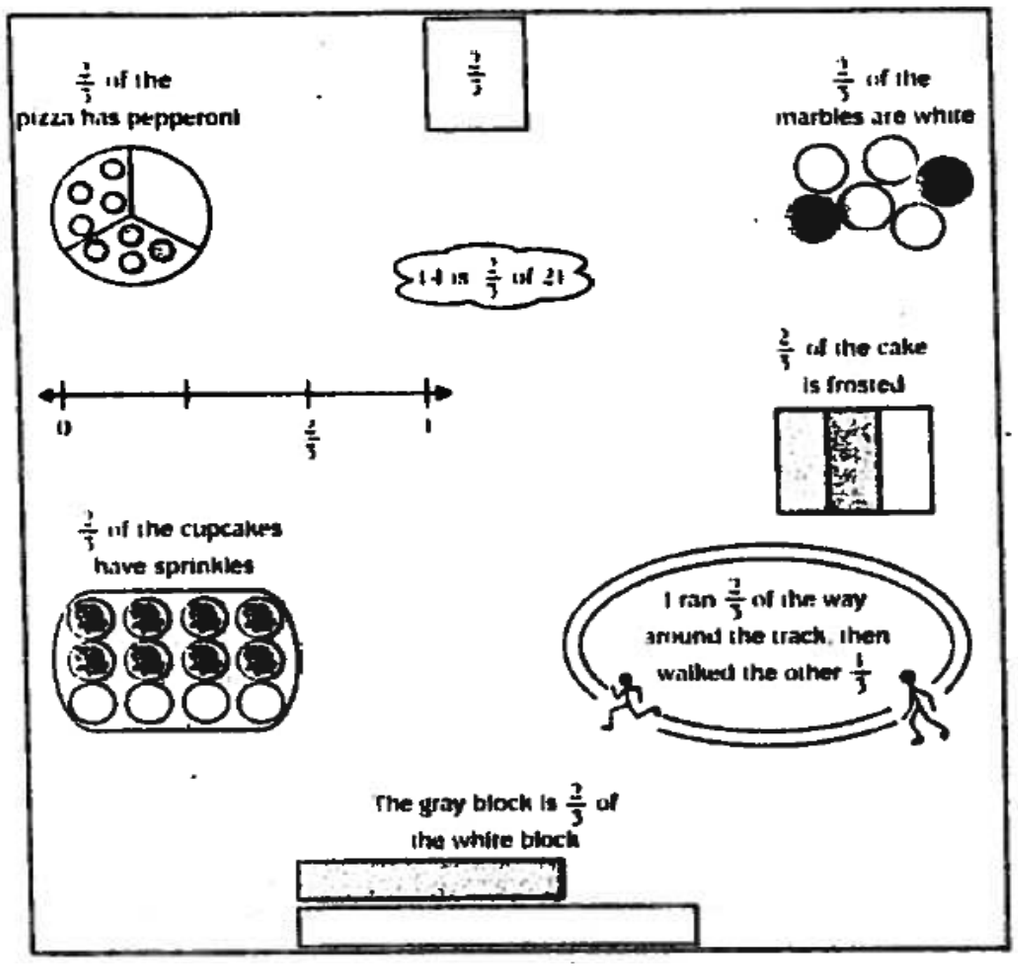
(SYMBOL)

Two-thirds

(WORDS)

Fractions Examples Poster

For your assigned fraction ... on the paper provided, make a poster with words, numbers, and pictures showing all the different examples of your fraction.

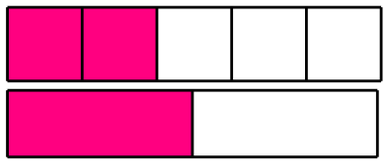


B) ORDERING FRACTIONS

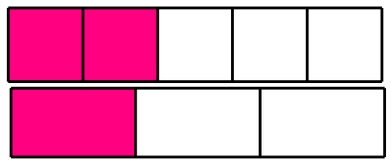
- order/compare fractions with:
  - > same numerator: 3/5 3/8
  - > same denominator: 4/6 5/6
  - > different numerators/different denominators: 2/5 1/3
- note: symbolic (abstract) requires knowledge of how to find equivalent fractions

Number Sense with Fractions

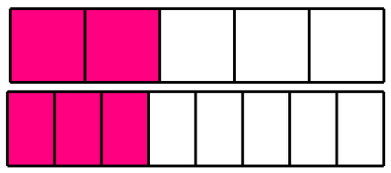
2/5 is



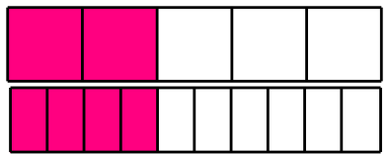
A little less than one half - 1/2



A little more then one third - 1/3



About the same as three eighths - 3/8



The same as four tenths - 4/10

C) EQUIVALENCE OF FRACTIONS

- different ways of representing the same amount: **renaming fractions**

- investigate halving, thirding & fifthing

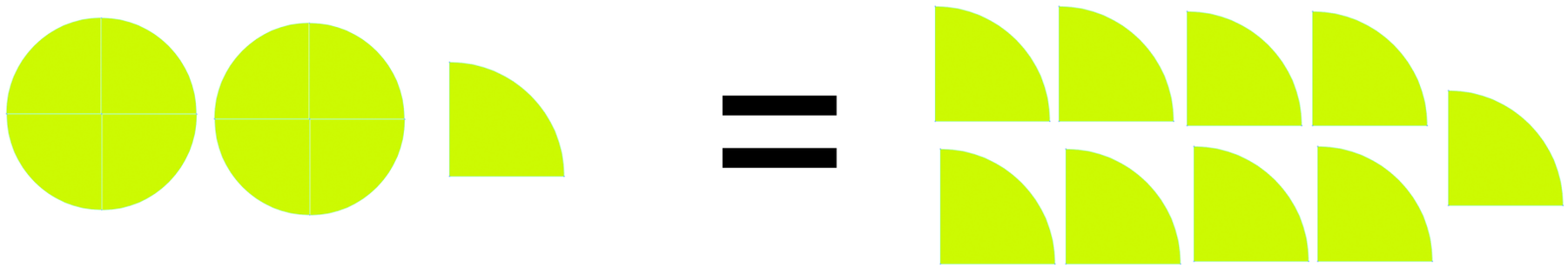
- use concrete models to derive

  <u>GENERALIZATION:</u> both numerator & denominator can be (x) by same number to get equivalent fractions

D) MIXED/IMPROPER FRACTIONS

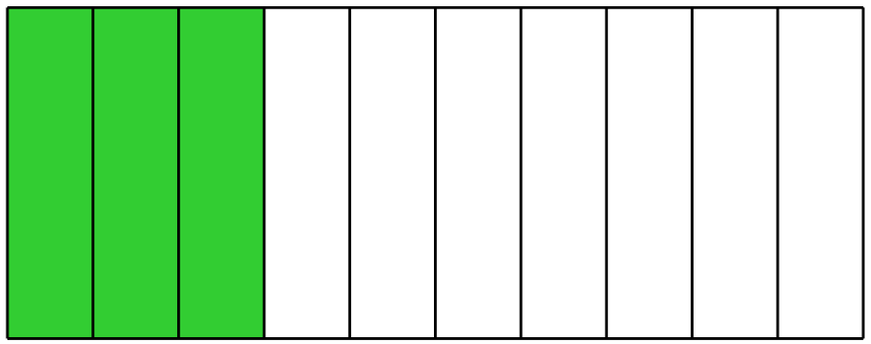
- write both numbers to represent models

2 ¼ = 9/4



CONNECTING FRACTIONS TO DECIMALS

COMPONENTS OF PLACE VALUE UNDERSTANDING



.3 or 3/10

(SYMBOL)

Three-tenths

(WORDS)

Advantages of Decimals

Relative size of decimals is easy to determine:

0.75 > 0.65

easier to see than

3/4 > 13/20

Rules of calculation are very similar to the rules for whole numbers (rules for calculations with fractions are very different**)**

Decimals fit on small calculator screens and are typed easily (fractions are awkward)

Decimals convert to percentages easily (both being based on tens and hundreds)

Decimals are totally compatible with the metric system of measurement

DECIMALS

Early Decimal Work

- use concrete manipulative to develop understanding of decimals (i.e. Base 10 material/graph paper)

- relate fractions to decimals (e.g., ½ to 0.5)

- build number sense (i.e. 0.3 < ½ because ½ = 0.5)

- connections: whole numbers – place value/algorithms
  percent (Gr.6)
  real life contexts

DEVELOPMENT OF DECIMALS

CONCRETE → REPRESENTATIONAL → ABSTRACT

Gr. 4 Tenths (relate to fractions - 10 tenths = 1 whole)

Gr. 5 Hundredths (use metric relationships)

Gr. 6 Thousandths (use metric relationships)

Equivalent Decimals

Ordering Decimals/Comparing

Rounding Decimals

Operations of Decimals –Computation

Addition & Subtraction

Gr. 4	(+/-)	to tenths
Gr. 5	(+/-)	to hundredths … including $ amounts
Gr. 6	(+/-)	to thousandths

Multiplication & Division:

Gr. 5	(x)	decimal nos. by 10, 100, 1000, 10 000 … **using mental strategies**
	(÷)	decimal nos. by 10, 100 … **using mental strategies**
Gr. 6	(x)	whole nos. by 0.1, 0.01, 0.001, 0.0001 … **using mental strategies**
	(x/÷)	decimal nos. by 10, 100, 1000, 10 000 … **using mental strategies**
	(x/÷)	decimals to tenths by whole numbers