

# Fractions

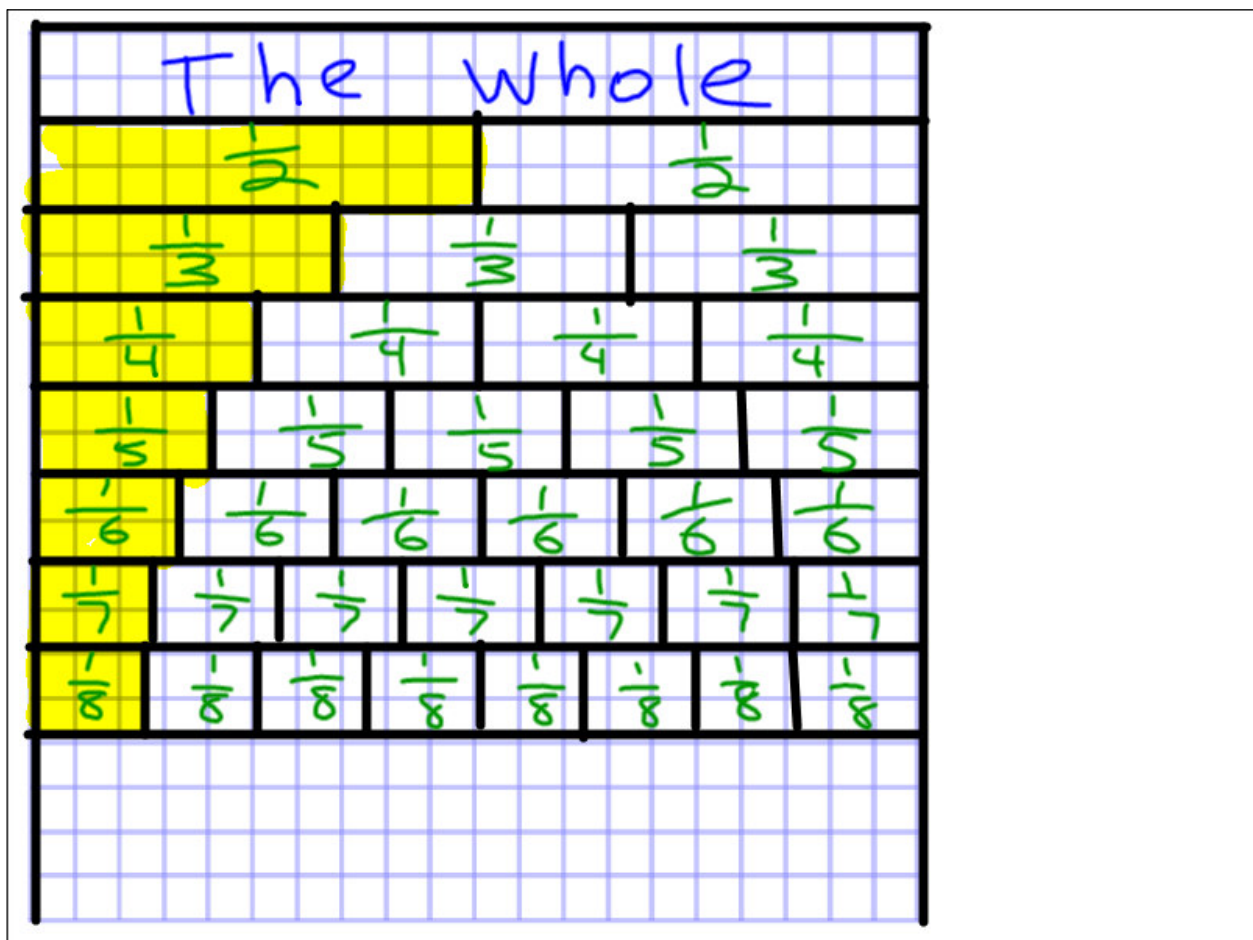
$\frac{a}{b}$  where both a and  
b are whole numbers

but b is not zero

a is called numerator b is called denominator

# Part-Whole

$\frac{1}{5}$  indicates that  
one whole is  
separated into five equal  
parts



numerator  
denominator

numerator  $\Rightarrow$  how many parts

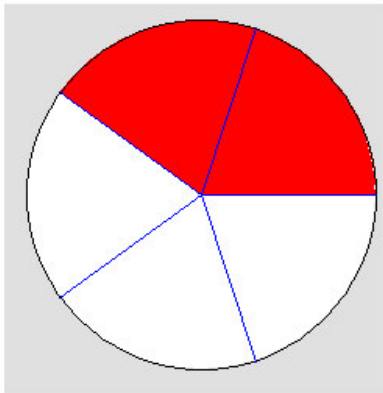
denominator  $\Rightarrow$  how many parts into which the whole is divided

5 tells us  
6 that  
we are looking  
at 5 parts  
of a whole  
divided into 6  
equal parts

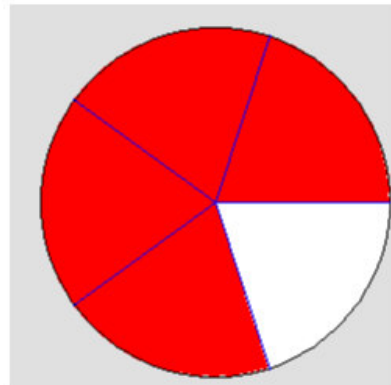
## a Quotient

the fraction  $\frac{2}{5}$  may be considered a quotient, 2 divided by 5

if you have 2 cookies and you want to split it up among 5 people equally, each person would get  $\frac{2}{5}$  of each cookie. in the end, you would have given 10 fifths or a total of 2 cookies to the group of 5 people.



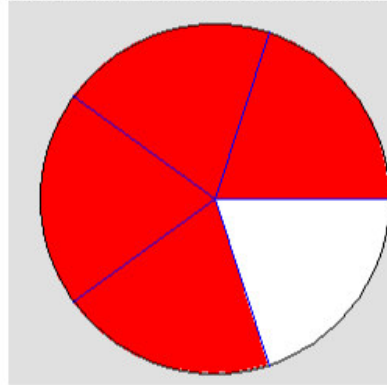
but what if you have four cookies to split equally among 5 people? then each would get  $\frac{4}{5}$  of a cookie (see below).



## A RATIO

WHEN A FRACTION IS EXPRESSED AS A RATIO, WE HAVE A SITUATION SUCH AS FOUR BOYS FOR EVERY FIVE BOYS IN THE GROUP.

$$\frac{4}{5} = \frac{8}{10}$$



AGAIN, WE HAVE 4/5, BUT THERE MIGHT BE 8 BOYS IN THE CLASS AND 10 GIRLS

WE STILL HAVE A RATIO OF 4/5 BUT THE NUMBER OF KIDS IN THE CLASS MAY VARY AS LONG AS THEY KEEP THE SAME PROPORTION.

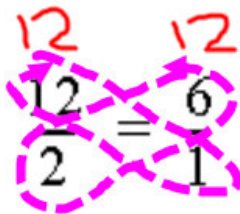
## HOW CAN WE DETERMINE IF TWO FRACTIONS ARE EQUAL OR PROPORTIONAL?

**State whether the ratios are proportional.**

$$\frac{12}{2} = \frac{6}{1}$$

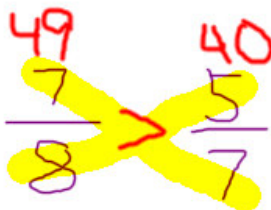
YES, because

- 12 divided by 2 is 6 and 6 divided by 1 is 6
- 12 divided by 6, the other numerator, is 2 and 2 divided by 1, the other denominator, also is 2
- cross multiply --  $6 \times 2 = 12$  and  $12 \times 1 = 12$



put the product of each cross multiplication above the numerator

if they are equal, it is a proportion and the fractions are equal



if one is greater than the other, then the fraction under the larger product is greater

since the product of 7 and 7 is 49, and the product of 8 and 5 is 40, the fraction  $7/8$  is greater than  $5/7$

# SIMPLIFYING FRACTIONS

STEP ONE -- LOOK FOR THE **GREATEST COMMON FACTOR (GCF)** IN BOTH THE NUMERATOR AND DENOMINATOR

STEP TWO -- DIVIDE EACH OF THE NUMERATOR AND DENOMINATOR BY THE GCF

STEP THREE -- IF YOU CHOSE A FACTOR THAT WAS NOT THE GREATEST COMMON FACTOR, THEN YOU WILL BE ABLE TO FIND ANOTHER COMMON FACTOR BY WHICH TO DIVIDE YOUR NUMERATOR AND DENOMINATOR UNTIL THERE ARE NO FACTORS OTHER THAN ONE.

$$\frac{6}{8} \div \frac{2}{2} = \frac{3}{4} \quad \text{GCF is 2}$$

$$\frac{20}{28} \div \frac{4}{4} = \frac{5}{7} \quad \text{GCF is 4}$$

IF YOU HAD CHOSEN 2 AS THE GCF, THEN YOU WOULD HAVE 10/14 WHICH WOULD HAVE A GCF OF 2 LEADING US TO 5/7



## MULTIPLYING FRACTIONS

when we evaluate ratios and proportions we can cross multiply,  
BUT when we multiply fractions we across multiply

$$\frac{1}{3} * \frac{1}{2} = \frac{1}{6}$$

Detailed description: The equation shows the multiplication of 1/3 and 1/2. Dashed arrows indicate the cross-multiplication process: one arrow from the numerator 1 of the first fraction to the denominator 2 of the second, and another from the denominator 3 of the first to the numerator 1 of the second. The result is 1/6.

one times one is one

3 times 2 is 6

so we have 1/6

THIS ALSO CAN BE DESCRIBED AS ONE THIRD OF ONE HALF IS ONE SIXTH

$$\frac{3}{4} * \frac{12}{7} = \frac{9}{7}$$

Detailed description: The equation shows the multiplication of 3/4 and 12/7. Dashed arrows indicate cross-multiplication. The numerator 12 of the second fraction is crossed out with a red line and replaced with 3, with a pink '3' written next to it. The denominator 4 of the first fraction is crossed out with a red line and replaced with 1, with a pink '1' written next to it. The result is 9/7.

FIRST, WE SIMPLIFY 12/4 TO 3/1  
SECOND, WE ACROSS MULTIPLY

IF WE CROSS MULTIPLIED IMMEDIATELY,  
YOU WOULD HAVE 36/28 WHICH WOULD  
HAVE SIMPLIFIED TO 9/7

ANY INTEGER CAN BE  
WRITTEN AS A FRACTION

$$\frac{4}{1} = 4$$

DIVISION BY ZERO

$$\frac{4}{0} = \text{UNDEFINED}$$

NOT A LEGAL FRACTION

ZERO IN THE NUMERATOR

$$\frac{0}{5} = 0$$