DECIMAL OPERATIONS

MULTIPLYING DECIMALS

Multiply the numbers. Don't worry about the decimal points just yet.

Count the total number of decimal places (or hops). In this case there are 3 on the top and one on the bottom.

Place the decimal point in the answer. Use the same number of hops (decimal places) that you counted.

$$\begin{array}{r} 1.124 \\ \times\ 1.5 \\ \hline 5620 \\ 1124 \\ \hline 16860 \end{array} \qquad \begin{array}{r} 1.124 \\ \times\ 1.5 \\ \hline 5620 \\ 1124 \\ \hline 16860 \end{array} \qquad \begin{array}{r} 1.124 \\ \times\ 1.5 \\ \hline 5620 \\ 1124 \\ \hline 1.6860 \end{array}$$

SHWOOPIE!

DIVIDING DECIMALS

Make the divisor a whole number by moving the decimal point to the right. Move the decimal point in the dividend by the same number of hops. This is the same as multiplying both numbers by 10 (for each hop.)

Place the decimal point in the answer lined up with decimal point in the dividend.

Divide the numbers. Be sure that the decimal points remain lined up.

$$.2\overline{)12.64} \qquad 2.\overline{)126.4} \qquad 2\overline{)126.4} \qquad \begin{array}{r} 63.2 \\ 2\overline{)126.4} \end{array}$$

more examples

$6.625 \div 0.53 \rightarrow 662.5 \div 53$

$$6.5\overline{)16.9} \qquad 65\overline{)169.} \qquad \begin{array}{r} 2.6 \\ 65\overline{)169.0} \\ -\ 130 \\ \hline 390 \\ -\ 390 \\ \hline 0 \end{array}$$

ADDING AND SUBTRACTING DECIMALS

136.04 + 102.27 → $\begin{array}{r} 136.04 \\ +102.27 \\ \hline 238.31 \end{array}$

Write in vertical column, aligning the decimal points.

Add each column, starting on right. Carry digits when needed.

2.37 - 0.031 → $\begin{array}{r} {\scriptstyle 6\ 1} \\ 2.370 \\ -\ 0.031 \\ \hline 2.339 \end{array}$

Write in vertical column, aligning the decimal points.

Subtract each column, starting on right and working left. Borrow as needed.

more examples

$5 - 0.85$

$$\begin{array}{r} {\scriptstyle 4\ \ 9} \\ 5.\cancel{0}\cancel{0} \\ -0.85 \\ \hline 4.15 \end{array} \qquad \begin{array}{r} 45.12 \\ +\ 3.71 \\ \hline 48.83 \end{array}$$

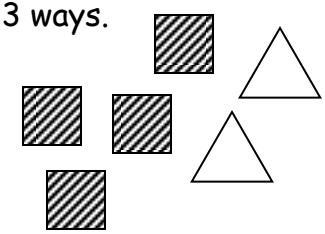
RATIOS

Ratio– Compares two amounts or values; they can be written in 3 ways.

As a fraction $\frac{2}{1}$

With a colon 2:1

With words "2 to 1"



EXAMPLE:

- Write the ratio of triangles to squares
  2:4 (simplify to 1:2)
- Write the ratio of total to squares
  6:2 (simplify to 3:1)

Remember: The word that comes first is the number that comes first!

RATIO WORD PROBLEM EXAMPLES:

A classroom has 15 girls and 10 boys.

1) What is the ratio of boys to total students?
2) What is the ratio of boys to girls?
3) What is the ratio of girls to boys?
4) What is the ratio of total students to girls?

ANSWERS:
1) 2:5
2) 2:3
3) 3:2
4) 5:3

IMPROPER FRACTIONS & MIXED NUMBERS

Mixed number: Whole number and a fraction

Improper fraction: numerator is greater than the denominator

MIXED NUMBERS TO IMPROPER FRACTIONS

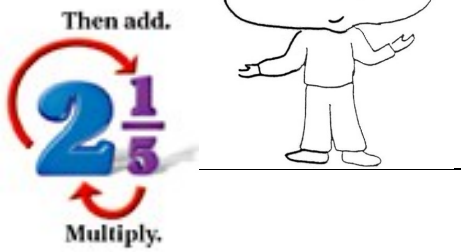
$2\frac{1}{8}$ (+ above, × below)

STEP 1: Multiply the denominator times the whole number.

STEP 2: Add your answer to the numerator.

STEP 3: Put your number over your original denominator.

$$\frac{8 \times 2 + 1}{8} = \frac{17}{8}$$



IMPROPER FRACTIONS TO MIXED NUMBERS

$\frac{25}{9}$

STEP 1: Divide the numerator by the denominator.

STEP 2: Take the remainder and make it the numerator of a fraction with the divisor as the denominator.

$$9\overline{)25} \quad 2 \text{ r}7$$
$$-18$$
$$7$$

$$9\overline{)25} \quad 2\ \frac{7}{9}$$
$$-18$$
$$7$$

$2\frac{7}{9}$

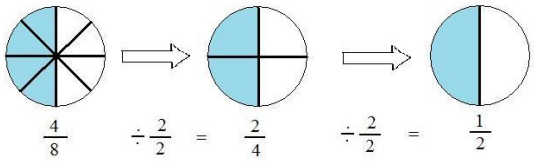
FRACTION BASICS

Fractions Bars

Use these fraction strips to find equivalent fractions.

ONE WHOLE															
$\frac{1}{2}$								$\frac{1}{2}$							
$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$			
$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$	
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$		$\frac{1}{10}$	
$\frac{1}{5}$				$\frac{1}{5}$				$\frac{1}{5}$				$\frac{1}{5}$			
$\frac{1}{3}$						$\frac{1}{3}$						$\frac{1}{3}$			
$\frac{1}{6}$				$\frac{1}{6}$				$\frac{1}{6}$				$\frac{1}{6}$			
$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$		$\frac{1}{12}$	

SIMPLIFYING FRACTIONS



When working with fractions, you need to write your answer in "simplest form." This means you need to simplify, or reduce, your fractions. At right, you can see that although the fraction $\frac{1}{2}$ is written with smaller numbers, it still represents the fraction $\frac{4}{8}$. $\frac{1}{2}$ is $\frac{4}{8}$ the fraction written in simplest form.

One strategy for simplifying fractions is to check to see if you can simplify by 2, by 3, by 5, and by 7 (the first four prime numbers). *See example at right.*

Example: Simplify the fraction $^{24}/_{108}$:

$$\frac{24}{108} \overset{\div 2}{=} \frac{12}{54} \overset{\div 2}{=} \frac{6}{27} \overset{\div 3}{=} \frac{2}{9}$$

MULTIPLYING FRACTIONS

MULTIPLYING FRACTIONS

Multiply the numerators $\frac{2}{5} \times \frac{3}{4} = \frac{6}{\ }$

Multiply the denominators $\frac{2}{5} \times \frac{3}{4} = \frac{6}{20}$

Reduce the fraction if necessary $\frac{6}{20} = \frac{3}{10}$

- Multiply the numerators.
- Multiply the denominators.
- SIMPLIFY!

EXAMPLE:

$$\frac{3}{4} \times \frac{1}{2} = \frac{3 \times 1}{4 \times 2} = \frac{3}{8}$$

MULTIPLYING MIXED NUMBERS

- Write mixed numbers as improper fractions.
- Put whole numbers over one
- Multiply the numerators.
- Multiply the denominators.
- SIMPLIFY! No improper fractions as an answer.

$1\frac{2}{3} \times 4\frac{1}{2} =$

$\frac{5}{3} \times \frac{9}{2} = \frac{45}{6} = 7\frac{3}{6}$ $7\frac{1}{2}$

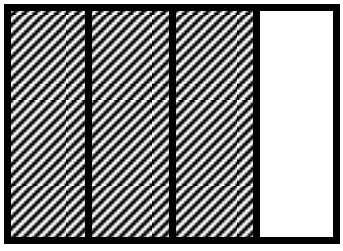
$1\frac{2}{3} \times 4 =$

Make 1 2/3 improper by doing the "MA" circle.
Make 4 improper, by putting 4/1.

$\frac{5}{3} \times \frac{4}{1} = \frac{20}{3}$ $6\frac{2}{3}$

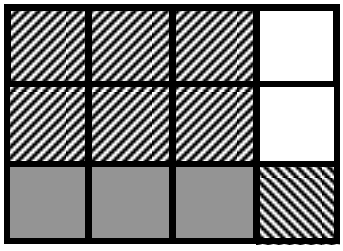
MODELING MULTIPLYING FRACTIONS

Find $\frac{1}{3}$ of $\frac{3}{4}$ by modeling.



To find $\frac{1}{3}$ of $\frac{3}{4}$, first draw $\frac{3}{4}$ vertically.

Shade three-fourths.



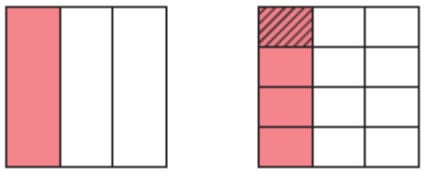
Then break the fourths into thirds horizontally.

Shade one-third.

The amount overlapping is the solution.

$\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{3}{12}$ or $\frac{1}{4}$.

Find $\frac{1}{4}$ of $\frac{1}{3}$.



$$\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$$

DIVIDING FRACTIONS

DIVIDING FRACTIONS

Invert the fraction that you are dividing by

Multiply the numerators and denominators

Simplify the fraction if necessary

K C F

$\frac{4}{5} \div \frac{2}{3} = \frac{4}{5} \times \frac{3}{2}$

$\frac{4}{5} \times \frac{3}{2} = \frac{12}{10}$

$\frac{12}{10} = 1\frac{1}{5}$

K C F

$\frac{1}{5} \div \frac{3}{8} =$

KEEP the first fraction

CHANGE divide to multiply

FLIP the second fraction (reciprocal)

$\frac{1}{5} \times \frac{8}{3} = \frac{8}{15}$

DIVIDING MIXED NUMBERS

- Write mixed numbers as improper fractions.
- Put whole numbers over one.
- KEEP the first fraction, CHANGE divide to multiply, FLIP the second fraction (reciprocal)
- Multiply the numerators.
- Multiply the denominators.
- SIMPLIFY! No improper fractions as an answer.

$1\frac{2}{3} \div 4\frac{1}{2} =$

K C F

$\frac{5}{3} \div \frac{9}{2}$

$\frac{5}{3} \times \frac{2}{9} = \frac{10}{18}$

$\frac{5}{9}$

Divide. Write each answer in simplest form.

A $\frac{4}{5} \div 5$

$\frac{4}{5} \div 5 = \frac{4}{5} \cdot \frac{1}{5}$

$= \frac{4 \cdot 1}{5 \cdot 5}$

$= \frac{4}{25}$

B $2\frac{2}{3} \div 1\frac{1}{6}$

$2\frac{2}{3} \div 1\frac{1}{6} = \frac{8}{3} \div \frac{7}{6}$

$= \frac{8}{3} \cdot \frac{6}{7}$

$= \frac{8 \cdot \overset{2}{\cancel{6}}}{\underset{1}{\cancel{3}} \cdot 7}$

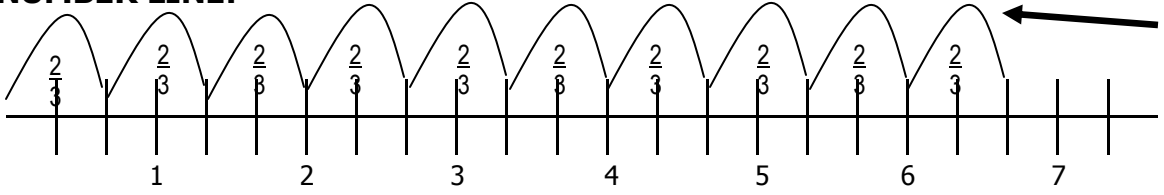
$= \frac{16}{7}$

$= 2\frac{2}{7}$

MODELING DIVIDING FRACTIONS

USING A NUMBER LINE:

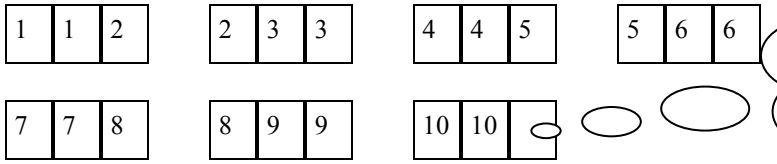
$7 \div \frac{2}{3}$



$\frac{2}{3}$ goes into 7 ten times and a little bit more!

USING BARS:

$7 \div \frac{2}{3}$



Draw seven bars and divide them into thirds. Count off to see how many two-thirds are in 7 full bars. There are 10 two-thirds with some left over.

ADDING FRACTIONS

ADDING WITH UNLIKE DENOMINATORS

YOU MUST HAVE A COMMON DENOMINATOR FOR ADDING AND SUBTRACTING FRACTIONS.

USING A RATIO TABLE

- Write both fractions in a table.
- Continue listing the multiples of the denominators until you find a common denominator.

FOR EXAMPLE:

$\frac{1}{4} + \frac{3}{5} =$

1				
4	8	12	16	20
3				
5	10	15	20	

So, 20 is the common denominator for 1/4 and 3/5

- Fill in the numerators on the table to find your fractions with a common denominator.

EXAMPLE CONTINUED:

1	2	3	4	5
4	8	12	16	20

3	6	9	12	
5	10	15	20	

- Add/subtract fractions.

EXAMPLE CONTINUED:

$\frac{5}{20}$

$+ \frac{12}{20}$

$\frac{17}{20}$

SIMPLIFY if you can!

USING THE X—=—

- Find the LCM of the denominators and write at the end of the x—= —

$\frac{2}{3} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$+ \frac{4}{9} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

The common denominator for 3 and 9 is 9 (LCM)

- Find the LCM of the denominators and write at the end of the x—= —

$\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$

$+ \frac{4}{9} \times \frac{1}{1} = \frac{4}{9}$

- Add or subtract

$\frac{6}{9}$

$+ \frac{4}{9}$

$\frac{10}{9} = 1\frac{1}{9}$

ADDING FRACTIONS

- Get a common denominator and then add.
- When you have an improper answer, divide the numerator by the denominator to make it into a mixed number.
- SIMPLIFY, if you can!

$5\frac{1}{3}$

1	2	3	4
3	6	9	12

$+ 2\frac{10}{12}$

$7\frac{14}{12}$

SIMPLIFY! $8\frac{2}{12} = 8\frac{1}{6}$

$12\overline{)14}$ → 1 remainder 2 (-12)

Writing 14/12 as a mixed number

$7 + 1\frac{2}{12}$

Add to your whole number

Find each sum

$2\frac{3}{4} + 1\frac{1}{6}$

$2\frac{3}{4} \rightarrow 2\frac{18}{24}$

$+ 1\frac{1}{6} \rightarrow + 1\frac{4}{24}$

$3\frac{22}{24} = 3\frac{11}{12}$

Multiply the denominators. 4 • 6 = 24
Write equivalent fractions with a common denominator of 24.
Add the fractions and then the whole numbers, and simplify.

$\frac{1}{3} + \frac{1}{5}$

$\frac{1}{3} \rightarrow \frac{5}{15}$

$+ \frac{1}{5} \rightarrow \frac{3}{15}$

$\frac{8}{15}$

Find a common denominator for 3 and 5.

Write equivalent fractions with 15 as the common denominator.

Add the numerators. Keep the common denominator.

SUBTRACTING WITH UNLIKE DENOMINATORS

YOU MUST HAVE A COMMON DENOMINATOR FOR ADDING AND SUBTRACTING FRACTIONS.

USING A RATIO TABLE

- Write both fractions in a table.
- Continue listing the multiples of the denominators until you find a common denominator.

FOR EXAMPLE:

$\frac{3}{4} + \frac{3}{5} =$

3					
4	8	12	16	20	
3					
5	10	15	20		

So, 20 is the common denominator for 1/4 and 3/5

- Fill in the numerators on the table to find your fractions with a common denominator.

EXAMPLE CONTINUED:

3	6	9	12	15
4	8	12	16	20

3	6	9	12	
5	10	15	20	

- Add/subtract fractions.

EXAMPLE CONTINUED:

$\frac{15}{20}$

$\frac{12}{20}$

$\frac{5}{20} \div 5 = \frac{1}{4}$

SIMPLIFY if you can!

USING THE X—=—

- Find the LCM of the denominators and write at the end of the x—= —

$\frac{2}{3} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

$-\frac{4}{9} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

The common denominator for 3 and 9 is 9 (LCM)

- Find the LCM of the denominators and write at the end of the x—= —

$\frac{2}{3} \times \frac{3}{3} = \frac{6}{9}$

$-\frac{4}{9} \times \frac{1}{1} = \frac{4}{9}$

- Add or subtract

$\frac{6}{9}$

$-\frac{4}{9}$

$\frac{2}{9}$

SUBTRACTING FRACTIONS

- Get a common denominator and then subtract.
- If you have a fraction that you cannot subtract, then borrow!

4 5 1/3	2	3	4	4 16	
	6	9	12		12
− 2 10/12					10
					12

4/12—10/12 requires you to BORROW. Borrow from the whole number and add the denominator to the numerator of the top fraction (It's the same thing as adding one whole as 12/12 + 4/12 = 16/12

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

$$8 - 5\frac{3}{4} =$$

Borrowing from a WHOLE NUMBER

$8 - 5\frac{3}{4}$

$8 \rightarrow 7\frac{4}{4}$

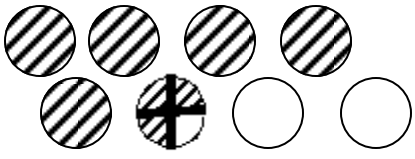
$-5\frac{3}{4} \rightarrow -5\frac{3}{4}$

$2\frac{1}{4}$

Write 8 as a mixed number with a denominator of 4. Regroup 8 as $7 + \frac{4}{4}$.

Subtract the fractions and then the whole numbers.

OR DRAW the problem!



$2\frac{1}{4}$

Draw 8 circles. Shade in 5 3/4. The amount left unshaded is your answer.

FRACTIONS-DECIMALS-PERCENTS

DECIMAL

Divide the numerator by the denominator . When there is nothing left to bring down, add a decimal and zero.

$$
\begin{array}{r}
0.125 \\
8\overline{)1.000} \\
-8 \\
\hline
20 \\
-16 \\
\hline
40 \\
-40 \\
\hline
\end{array}
$$

PERCENTAGE

1. Divide numerator by denominator

$$
\begin{array}{r}
0.125 \\
8\overline{)1.000}
\end{array}
$$

2. Multiply answer by 100 and add a percent sign

0.175 x 100 = 12.5%

Or "SHWOOPIE" move the decimal two places to the right

Convert to

$\frac{1}{8}$

Fraction

PERCENTAGE

Multiply by 100 and add a percent sign

or

"SWOOPIE" move the decimal two places to the right

Convert to

0.125

Decimal

FRACTION

1. Remove decimal point and write the number as the numerator.

.125

2. The denominator is a multiple of 10, depending on the place value of the last digit

1000

3. Write the fraction and reduce to the lowest terms

$\frac{125}{1000} = \frac{25}{200} = \frac{1}{8}$

FRACTION

1. Divide the percentage by 100 and drop the percent sign.

12.5% = .125

Or

SHWOOPIE two steps to the left

2. Write the decimal as a fraction and reduce it to lowest terms

$\frac{125}{1000} = \frac{1}{8}$

Convert to

12.5%

Percentage

DECIMAL

1. Divide the percentage by 100 and drop the percent sign.

12.5% = .125

Or "Swoopie" two decimal places to the left

fractions

- To turn a FRACTION into a DECIMAL, **DIVIDE.**
- Which number goes in the house? NUMERATOR
- No REMAINDERS.
- When you have nothing to bring down, add a DECIMAL and a ZERO!

FRACTION TO DECIMAL EXAMPLES:

$\frac{1}{5}$

$$5\overline{)1.0} = 0.2$$

$\frac{3}{8}$

$$8\overline{)3.000} = 0.375$$

$\frac{1}{9}$

$$9\overline{)1.00000} = 0.11111$$

To write a **FRACTION** as a **PERCENT**, first turn it into a decimal, then move the decimal 2 times to the right.

the number cycle

decimals

- To turn a DECIMAL into a PERCENT, move the DECIMAL two times to the RIGHT.

  EXAMPLES:

  0.72 = 72 %

  0.124 = 12.4 %

  1.34 = 134 %

- To write a DECIMAL as a FRACTION write the number over its place value.

  EXAMPLES:

  $0.23 = \frac{23}{100}$ $0.7 = \frac{7}{10}$

percents

- To turn a PERCENT into a DECIMAL, move the DECIMAL two times to the LEFT.

  EXAMPLES:

  50% = 0.50

  6% = 0.06

  200% = 2.00

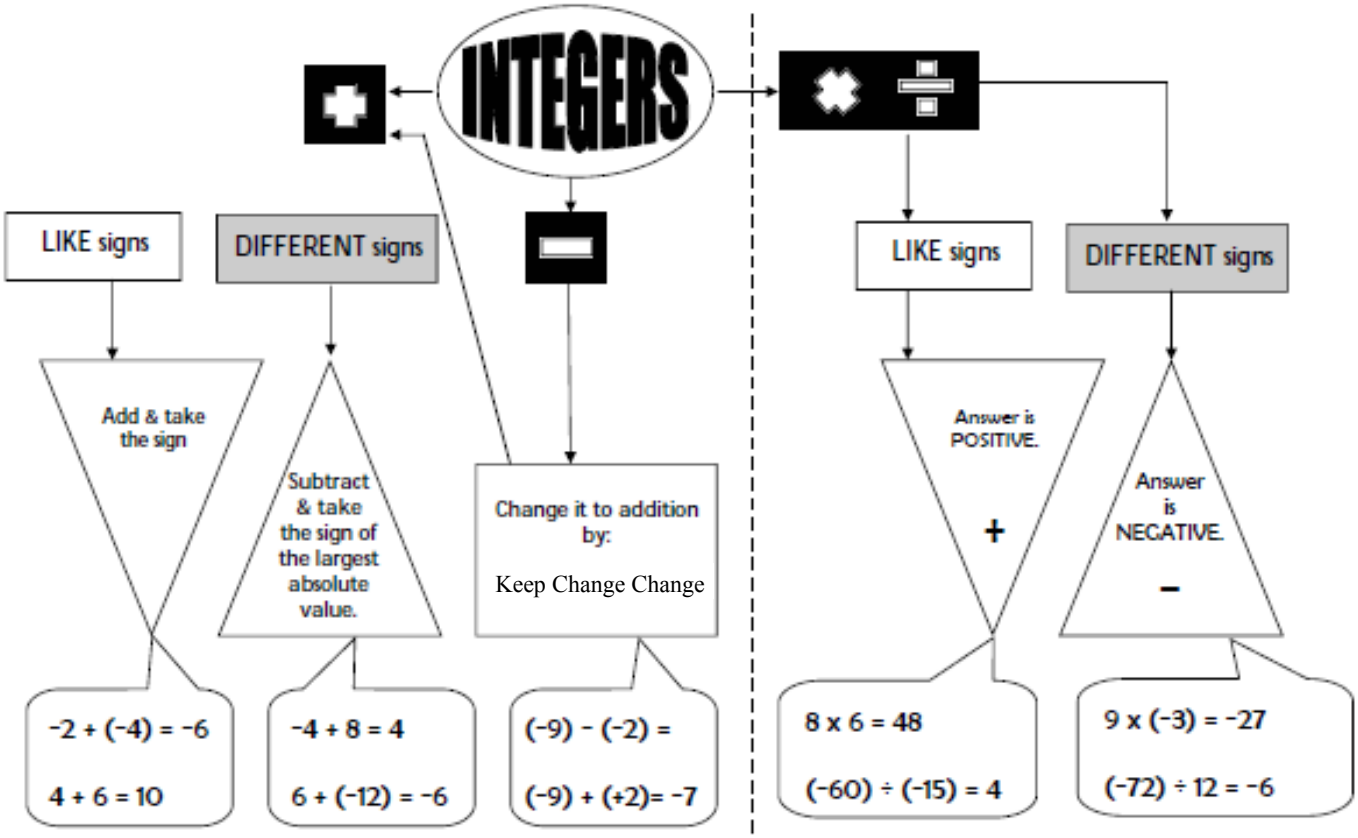
- To write a PERCENT as a FRACTION write it over 100, because percent means "out of 100."

  EXAMPLES:

  $26\% = \frac{26}{100} = \frac{13}{50}$ $5\% = \frac{5}{100} = \frac{1}{20}$

INTEGER RULES

RULES FOR OPERATIONS



FOUND AT http://www.sw-georgia.resa.k12.ga.us/integer%20rules.pdf

ADDING INTEGERS

Same Sign: Add and keep the sign

2 + 2 = 4

Positive + Positive = Positive

(-2) + (-2) = (-4)

Negative + Negative = Negative

Different Signs: Subtract and keep the sign of the larger value (from zero)

(-9) + 2 = (-7)

Big Negative + Small Positive = Negative

(-2) + 9 = 7

Small Negative + Big Positive = Positive

MULTIPLYING AND DIVIDING INTEGERS

Positive x Positve = Positive

Negative x Negative = Positive

Negative x Positive = Negative

Positive x Negative = Negative

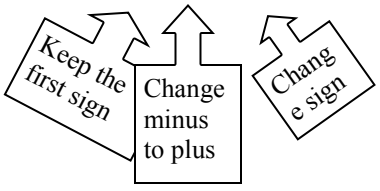
Division (same pattern)

SUBTRACTING INTEGERS

Subtracting a negative is like ADDING A POSITIVE!

2 - (-2) =

2 + 2 = 4

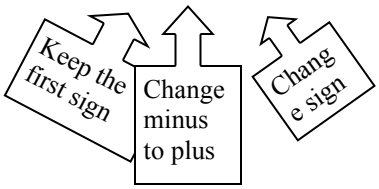


KEEP CHANGE CHANGE

Subtracting a positive IS subtracting or like ADDING A NEGATIVE!

-8 - 4 =

-8 + (-4) = - 12



Subtracting Integers

Subtraction is the same as **adding the opposite**. so rewrite subtraction problems as addition problems and then use addition rules.

-6 – 3 = -6 + -3 = -9

4 – -9 = 4 + 9 = 13

2 – 7 = 2 + -7 = -5