FRACTION

HANDBOOK

****

**NOTICE:** Please use at ALL times… when fractions just don’t make any sense.

Name: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Table of Contents**

Finding a Common Denominator………………………………………….4

Comparing Fractions……………………………………………………….……5

Finding Equivalent Fractions………………………………………..…...….6

Mixed Numbers and Improper Fractions……………………..…...….7

Changing a Mixed Number into an Improper Fraction……..……8

Changing an Improper Fraction into a Mixed Number……..……9

Changing an Improper Fraction into a Whole Number…….…..10

Finding the Least Common Multiple…………………………………….11

Estimating Sums and Differences of Fractions………………………12

Estimating Sums and Differences of Mixed Numbers……………13

Changing a Fraction into a Decimal…………………………….…….…..14

Changing a Fraction into a Percent……………………………….………15

Changing a Fraction to a Decimal, to a Percent……………..……..16

Finding a Percent of a number…………………………………………..…17

Reducing or Simplifying a Fraction (Method #1)…………..……...18

Reducing or Simplifying a Fraction (Method #2)…………..……...19

Addition of Fractions with Like Denominators………….…...……..20

Addition of Fractions with Unlike Denominators…………………..21

Addition of Mixed Numbers with Like Denominators…………...22

Addition of Mixed Numbers with Unlike Denominators…….….23

Addition of Mixed Numbers w/ improper fraction answer…....24

Subtraction of Fractions with Like Denominators……………..……25

Subtraction of Fractions with Unlike Denominators…………..….26

Subtracting Mixed Numbers with Like Denominators………..….27

Subtracting Mixed Numbers with Like Denominators

if you cannot subtract numerators……………………………..……..….28

Subtracting Mixed Numbers with Borrowing…………………..…….29

Subtracting Mixed Numbers with Unlike Denominators……..…30

Subtracting a Whole Number from a Mixed Number………..…..31

Estimating Products of Fractions……………………………………………32

Multiplying Fractions……………………………………………….….……..…33

Multiplying Fractions and Whole Numbers……………….……..……34

Multiplying Mixed Numbers…………………………………………….……35

Dividing Fractions………………………………………………………..…..……36

Fraction of Fraction Problems…………………………………….…………37

Fraction of Whole Number Problems………………………………..….38

Fraction of Whole Number Problems (Part/Whole)………….…..39

Glossary of Fraction Terms………………………………………..…….….40-41

**Finding a Common Denominator**

**There are TWO ways to find a common denominator**

1.List the ***MULTIPLES*** of each denominator until you find the **LOWEST COMMON DENOMINATOR (LCD)**.

4, 8, **12**, 16, 24

and

6, **12** , 18, 24

***OR***

2. ***MULTIPLY*** the ***TWO*** denominators together.

and

4 \* 6 = 24

**Comparing Fractions**

**greater than (the alligators mouth eats the biggest number)**

**less than (arrow points to the smaller number)**

**equal**

**Cross – Multiply**

1. Start with the ***denominator*** of one fraction and ***MULTIPLY* it by the numerator of the other fraction**.

**16**

1. **REPEAT**…start with the other ***denominator*** and ***MULTIPLY* it by the numerator of the other fraction**.

**16**

**18**

18 is greater than 16……so

**Finding Equivalent Fractions**

* When you are finding an equivalent fraction…you are finding fractions that are equal to each other or that have the same value.
* **Equivalent = Equal or “the same as”**

**There are two rules for finding equivalent fractions:**

1. **MULTIPLY** the ***denominator*** and the ***numerator*** by the **SAME** number.

=  ( is equivalent or equal to )

*OR*

1. **DIVIDE** the ***denominator*** and the ***numerator*** by the **SAME** number.

= ( is equivalent or equal to )

**Mixed Numbers and Improper Fractions**

* **Remember that a mixed number has a whole number and a fraction.**

***numerator***

**Mixed**

**Number *whole denominator***

***number***

* **Remember that an improper fraction has a numerator that is *LARGER* than the denominator.**

***numerator***

**Improper**

**Fraction *denominator***

**Changing a Mixed Number into an Improper Fraction**

1. Start with the ***denominator of the fraction*** and ***MULTIPLY*** it by the ***whole number***.

In the example below**:** 4 x 2 = 8

**+**

**X**

1. Then ***ADD the answer*** to the ***numerator***, this becomes the ***new numerator***.

In the example above**:** 8 + 3 = 11

1. **Keep the denominator the SAME**

**Changing an Improper Fraction into a Mixed Number**

1. Ask yourself how many times will the denominator go into the numerator. Simply put…divide the numerator by the denominator. This becomes your ***WHOLE NUMBER***.

(4 goes into 15….3 WHOLE TIMES)

1. **How many are left over? What is the remainder? How many more do you need to reach the numerator? This is the new numerator.**

There would be 3 left over. This is your new numerator.

***remainder***

1. **The denominator stays the same.**

***whole number***

***denominator stays the same***

**Changing an Improper Fraction into Whole Number**

1. Start by ***DIVIDING*** the ***numerator*** by the ***denominator***.

(6

1. Your answer becomes the ***whole number***.

3

**Finding the Least Common Multiple**

**Mutliples:** are your basic multiple facts for a particular number. Ex: the multiples of 5 are 5, 10, 15, 20, 25, 30….the multiples of 3 are 3, 6, 9, 12, 15….

**Common Multiple:** is a number that is a multiple of two or more numbers.

**Least Common Multiple:** is the least or smallest number that is a multiple of both numbers.

Find the Least Common Multiple of 4 and 6.

1. **Begin by listing the multiples or basic multiplication facts** of each number to find the smallest number that they both have in common.

**Multiples of 4:** 4, 8, , 16, 20, 24, 28, 32, 36

**Multiples of 6:** 6, , 18, 24, 30, 36, 42, 48

**12**

**The Least Common Multiple of 4 and 6 is**

**Estimating Sums and Differences of Fractions**

Determine if a fraction is closest to 0, , or 1

* When the numerator is small compared to the denominator, the benchmark we use is **0.**
  + example: = 0
* When numerator is about half of the denominator, we will be using the benchmark .
  + example: =
* When the numerator and denominator are very close, we

use the benchmark **1 whole**.

* example: = 1 whole

Let’s take our benchmarks a little further, by

using them to estimate sums and differences.

Estimate +

**Step 1:** First, replace each fraction with a benchmark.

= and = 1

**Step 2:** Then add the benchmarks

**1**

+ 1 =

**Estimating Sums and Differences of Mixed Numbers**

* When the fractional part is **less than** you keep the whole number the same.
  + example: 6 = 6
* When the fractional part is **greater than or equal to**  you round the whole number up.
  + example: = 4

Let’s take what we’ve learned and try to estimate sums and differences of mixed numbers.

Estimate: **2** **+**

**Step 1:** First, determine if the fractional parts are less than or greater than/equal to .

**2** = less than so you keep the **2** wholes

= greater than so you would round the 3 to **4** wholes

**Step 2:** Then add the whole numbers

**6**

+ 4 =

**Changing a Fraction to a decimal**

**In order to change a fraction to a decimal, you must change (or rename) the fraction so that it has a denominator of 10, 100, or 1000.**

1. Take the fraction and change the denominator to 100, by multiplying the denominator and numerator by 4

=

1. The new fraction is now we can change this fraction into a decimal. Think of how you would read this fraction… twenty-eight hundredths. Write that as a decimal.

0.28

**Change a Fraction into a PERCENT**

1. Begin by ***changing the denominator to a 100.***

=

**HINT: Any numerator with a denominator of 100 becomes a percent!**

So the fraction = 16%

Example 1: = 50%

Example 2: = 73%

Example 3: = 95%

**Change a Fraction into a DECIMAL and then into a PERCENT**

Going from a fraction, to a decimal, to a percent, can be done on a ***CALCULATOR!!!!!***

1. ***Divide the numerator by the denominator***. This will give you the ***DECIMAL equivalent to* .**

= 0.375

1. Take the answer of 0.375 and ***MULTIPLY it by 100***. This will give you the ***PERCENT equal to* .**

**38%**

0.375 x 100 = 37.5 ***rounded to***

**Example 1:**

**71%**

= 0.7142857 x 100 = 71.4 or

**Example 2:**

**67%**

= 0.666666667 x100 = 66.6 or

**Finding a Percent of a Number**

40% of 15

***Follow these steps:***

1. ***Multiply*** the **PERCENT** by the **NUMBER** (remember that “**of**” in math means multiply).

40 x 15 = 600

1. Divide the answer by 100…or simply move the decimal point ***TWO*** places to the ***LEFT***

600 = 6.00

1. Round to the nearest ***ONE*** (***WHOLE NUMBER***).

6

6.00 =

**To REDUCE or SIMPLIFY a Proper Fraction**

* Also known as: *reduce, lowest terms, simplest form*

**METHOD #1**: Dividing by the Greatest Common Factor (GCF)

**Begin by listing the factors** to find the largest factor shared by both the numerator and denominator. Make a ***factor rainbow*** for the numerator and denominator.

***Factors of 16 are***: ***1, 2, 4, , 16***

***Factors of 24 are: 1, 2, 3, 4, 6, , 12, 24***

1. is the ***GREATEST*** factor on both lists. To reduce the

fraction, ***DIVIDE*** the ***numerator*** and ***denominator*** by 8.

=

**To REDUCE or SIMPLIFY a Proper Fraction**

**METHOD #2**: Prime Factorization (factor tree)

When reducing a proper fraction, follow these steps:

1. **Factor the numerator.**
2. **Factor the denominator.**
3. **Cancel-out common prime numbers.**
4. **Re-write your answer as the simplified fraction.**

=

1. Prime Factorization of 24 = 2 x 2 x 2 x 3
2. Prime Factorization of 56 = 2 x 2 x 2 x 7
3. Cancel out (or cross-out) common prime numbers… you can cross-out three 2’s in the numerator and three 2’s in the denominator.
4. The simplified fraction is

**Addition of Fractions with like Denominators**

1. If the ***denominators are the SAME***, simply ***ADD the numerators*** and ***keep the denominator the SAME***.

+

**Addition of Fractions with Unlike Denominators**

**1**. Find the **LOWEST COMMON DENOMINATOR (LCD)** between the two denominators by ***listing the multiples of each denominator***.

4, 8, , 12, , , 16

+ 6, 12 , 18, 24

**2**. **RENAME (or CHANGE) EACH FRACTION** using the ***Lowest Common Denominator***

\*remember…what ever you do to the denominator you have to do to the numerator

=

+ =

**3**. Now that the fractions have a common denominator you need to **ADD THE NUMERATORS** and then **KEEP THE DENOMINATOR THE SAME**.

+

**Adding Mixed Numbers with like denominators**

1. Begin by ***ADDING the WHOLE NUMBERS***.

+

2

1. Then ***ADD the NUMERATORS*** and ***keep the denominators the SAME***.

+

2

**Adding Mixed Numbers with unlike denominators**

1. Begin by ***renaming*** (or changing) the fractions by finding a common denominator…but ***DO NOT change the WHOLE NUMBERS***.

2 = 2

+ =

1. ***ADD the WHOLE NUMBERS*** then ***ADD the NUMERATORS*** and ***keep the DENOMINATOR the SAME***.

2

+

**Adding Mixed Numbers when your answer has an Improper Fraction**

1. Begin by ***renaming*** (or changing) the fractions by finding a common denominator…but ***DO NOT change the WHOLE NUMBERS.***

1 = 1

+ =

1. ***ADD the WHOLE NUMBERS*** then ***ADD the NUMERATORS*** and ***keep the DENOMINATOR the SAME***.

1

+

1. Change the improper fraction into a mixed number. ***ADD the whole numbers*** and use the new fraction.

becomes so…***ADD*** the 1 WHOLE to the 5 WHOLES to get 6 WHOLES.

*becomes*

**Subtraction of Fractions with like Denominators**

1. If the ***denominators are the SAME***, simply ***SUBTRACT the numerators*** and ***keep the denominator the SAME***.

-

or

**Subtraction of Fractions with Unlike Denominators**

**1**. Find the **LOWEST COMMON DENOMINATOR (LCD)** between the two denominators by ***listing the multiples of each denominator***.

4, 8, , 12, , , 16

- 6, 12 , 18, 24

**2**. **RENAME EACH FRACTION** using the ***Lowest Common Denominator***

\*remember…what ever you do to the denominator you have to do to the numerator.

=

- =

**3**. Now that the fractions have a common denominator you need to **SUBTRACT THE NUMERATORS** and then **KEEP THE DENOMINATOR THE SAME**.

-

or

**Subtracting Mixed Numbers with like denominators**

1. Begin by ***SUBTRACTING the WHOLE NUMBERS***.

2

1. Then ***SUBTRACT the NUMERATORS*** and ***keep the denominators the SAME.***

2 or 2

**Subtracting Mixed Numbers with like denominators…**

**If you cannot subtract numerators**

\* If you start with the following fractions:

-

1. Begin by changing each ***MIXED NUMBER*** into an ***IMPROPER FRACTION***.

4 =

- =

1. ***SUBTRACT the numerators*** in the improper fraction and ***keep the denominator the SAME***.

-

or

**Subtracting Mixed Numbers & Borrowing**

*Follow these steps:*

1. **Borrow 1 whole from the whole number (only the first fraction changes)**
2. **Add the denominator to the numerator…this becomes the “new” numerator…keep the denominator the same…then subtract**

- =

2. - =

or

**Subtracting Mixed Numbers with unlike denominators**

1. Begin by renaming (or changing) the fractions by finding a common denominator…but ***DO NOT change the WHOLE NUMBERS***.

2 = 2

- =

1. ***SUBTRACT the WHOLE NUMBERS*** then ***SUBTRACT the NUMERATORS*** and ***keep the DENOMINATOR the SAME***.

2

or

**Subtracting a Whole Number**

**From a Mixed Number**

*Follow these steps:*

1. **Turn the whole number into a mixed number by taking away 1 whole and creating a fraction using the same denominator as the existing fraction**
2. **Subtract whole numbers, then subtract numerators, denominator stay the same**

- =

- =

**Estimating Products of Fractions**

Estimate: **3 x**

***Remember***… When the fractional part is **greater than or equal to**  you round the whole number up…**less than** keep it the same.

* = greater than so you would round the 6 to **7** wholes

21

* 3 x 7 =

Estimate: x **19**

We need to use compatible numbers here…for the ***whole number*** and the ***denominator*** of the fraction.

* For 19…the nearest multiple of 4 is 20
* Rewrite the problem as: x **20**

of 20 = 15

15

20 ÷ 4 = 5 and 5 x 3 =

**Multiplying Fractions**

**FINALLY! Believe it or not…multiplying fractions is EASY**

1. ***Multiply*** **BOTH** ***Numerators***.

\* =

1. ***Multiply*** **BOTH** ***Denominators***.

\* =

or

**Multiplying Fractions and Whole Numbers**

1. Put the ***Whole Number over 1***.

\* 3 becomes \*

2. ***MULTIPLY*** the ***NUMERATORS***.

\* =

3. ***MULTIPLY*** the ***DENOMINATORS***.

\* =

\* If your answer is an improper fraction…please change into a mixed number!!

**Multiplying Mixed Numbers**

1. Begin by changing the ***MIXED NUMBERS*** into ***IMPROPER FRACTIONS***.

\* becomes \*

2. ***MULTIPLY*** the ***NUMERATORS.***

\* =

3. ***MULTIPLY*** the ***DENOMINATORS***.

\* =

4. Changethe ***IMPROPER FRACTION*** into a ***MIXED NUMBER***.

becomes

**Dividing Fractions**

\* If you start with the fractions:

1. Begin by taking the ***second fraction*** and ***FLIP*** it.

1. Once the second fraction is flipped, it now becomes a ***MULTIPLICATION problem***…follow the rules for multiplying fractions.

**=**

1. Change the improper fraction into a ***MIXED NUMBER*** or a ***WHOLE NUMBER***.

6

=

**Fraction of Fraction Problems**

**HINT!! “OF” in math = MULTIPLY**

1. **What is of 3? (HINT!! put the whole number over 1)**

\* = change to a ***mixed number***

1. **What is of ?**

\* =

1. **What is of 12?**

8

\* = change to a ***mixed numbe***r or a ***whole number***

**Fraction of Whole Number Problems**

**Cross - Divide…then Multiply**

1. ***DIVIDE*** the ***whole number*** of the fraction by the ***denominator***.

of 21

21 ÷ 3 = 7

1. Then ***MULTIPLY*** the answer (from step 1) by the ***numerator*** of the fraction.

of 21

14

7 × 2 =

**Fraction of Whole Number Problems**

To find a ***PART…***

Example: If 21 counters are the whole set, how many is of the set?

of 21 = 14

To find a ***WHOLE…***

Example: If 9 counters are of the set, how many counters are in the whole set?

of 9 = 21

**Glossary of Fraction Terms**

**Equivalent Fraction:** A fraction or set of fractions that is equal to each other. The fractions have different denominators, but have the same value. Example: =

**Improper Fraction:** A fraction where the numerator is bigger than the denominator. A “top-heavy” fraction. Example:

**Mixed Number:** A fraction made up of a whole number and a fraction.

Example:

**Numerator:** The top number of a fraction

**Denominator:** The bottom number of a fraction. Remember “d” for down and “d” for denominator.

**Simplest Form:** Reducing a fraction into its smallest form. Also known as “lowest terms.”

**Multiples:** Used when finding a common denominator. Think of your multiplication facts.

**Factors:** Used when reducing (or writing in simplest form) a fraction. A factor is a number that is divisible by the target number.

Example: 1, 2, 3, 4, 6, 8, 12, 24 are factors of 24

**Quick Common Denominator:** Multiplying two denominators together to find a common denominator. Used rather than listing out the multiples.

**Rename:** To find an equivalent fraction. Multiply the numerator and denominator by the same number.

**Whole:** The entire object, collection of objects, or quantity.

**Unit Fraction:** A fraction with a “1” for the numerator. Examples:, ,

**LCD:** Lowest Common Denominator. Use when finding a common denominator. List out the multiples of each denominator and find the smallest multiple they both have in common.

**GCF:** Greatest Common Factor. Use when reducing or writing a fraction in simplest form. List out the factors of the numerator and the denominator and find the largest factor that both numbers have in common.

**“of”:** Means to multiply when you have “fraction of fraction” problems.

**NOTES:**