FRACTION

HANDBOOK

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

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

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**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)**.

 $\frac{1}{4}$ 4, 8, **12**, 16, 24

 and

 $\frac{2}{6}$ 6, **12** , 18, 24

***OR***

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

 $\frac{1}{4}$ and $\frac{2}{6}$

 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**

$\frac{3}{4}$ $\frac{4}{6}$

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

**16**

**18**

$\frac{3}{4}$ $\frac{4}{6}$

18 is greater than 16……so $\frac{3}{4}$ $>$ $\frac{4}{6}$

**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.

$\frac{2x2}{3x2}$ = $\frac{4}{6}$ ( $\frac{2}{3}$ is equivalent or equal to $\frac{4}{6}$ )

*OR*

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

$\frac{6÷3}{9÷3}$ = $\frac{2}{3}$ ( $\frac{6}{9}$ is equivalent or equal to $\frac{2}{3}$ )

**Mixed Numbers and Improper Fractions**

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

 ***numerator***

 **Mixed** $2\frac{3}{4}$

 **Number *whole denominator***

 ***number***

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

 ***numerator***

 **Improper** $\frac{11}{4}$

 **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

 **+**

$2 \frac{ 3}{ 4}$

 **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**

$$\frac{11}{4}$$

**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***.

$\frac{15}{4}$ (4 goes into 15….3 WHOLE TIMES) $3\frac{?}{?}$

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.

$$3\frac{3}{?}$$

 ***remainder***

$$3\frac{3}{4}$$

$$\frac{3}{4}$$

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***.

$\frac{6}{2}$ (6$÷2=3)$

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, $\frac{1}{2}$, or 1

* When the numerator is small compared to the denominator, the benchmark we use is **0.**
	+ example: $\frac{1}{8}$ = 0
* When numerator is about half of the denominator, we will be using the benchmark $\frac{1}{2}$.
	+ example: $\frac{5}{9}$ = $\frac{1}{2}$
* When the numerator and denominator are very close, we

use the benchmark **1 whole**.

* example: $\frac{5}{6}$ = 1 whole

Let’s take our benchmarks a little further, by

using them to estimate sums and differences.

Estimate $\frac{7}{12}$ + $\frac{4}{5}$

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

$\frac{7}{12}$ = $\frac{1}{2}$ and $\frac{4}{5}$ = 1

**Step 2:** Then add the benchmarks

**1**$\frac{1}{2}$

$\frac{1}{2}$ + 1 =

**Estimating Sums and Differences of Mixed Numbers**

* When the fractional part is **less than** $\frac{1}{2}$you keep the whole number the same.
	+ example: 6 $\frac{2}{8}$ = 6
* When the fractional part is **greater than or equal to** $\frac{1}{2}$ you round the whole number up.
	+ example: $3\frac{5}{6}$ = 4

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

Estimate: **2**$\frac{4}{10}$ **+** $3\frac{5}{8}$

**Step 1:** First, determine if the fractional parts are less than or greater than/equal to $\frac{1}{2}$.

**2**$\frac{4}{10}$ = less than $\frac{1}{2}$ so you keep the **2** wholes

$3\frac{5}{8}$ = greater than $\frac{1}{2}$ so you would round the 3 to **4** wholes

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

 **6**

$2$ + 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 $\frac{7}{25}$ and change the denominator to 100, by multiplying the denominator and numerator by 4

 $\frac{7x4}{25x4}$ = $\frac{28}{100}$

1. The new fraction is $\frac{28}{100}$ 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.***

$\frac{4x4}{25x4}$ = $\frac{16}{100}$

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

So the fraction $\frac{16}{100}$ = 16%

Example 1: $\frac{50}{100}$ = 50%

Example 2: $\frac{73}{100}$ = 73%

Example 3: $\frac{95}{100}$ = 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*** $\frac{3}{8}$**.**

$\frac{3}{8}$ = 0.375

1. Take the answer of 0.375 and ***MULTIPLY it by 100***. This will give you the ***PERCENT equal to*** $\frac{3}{8}$**.**

**38%**

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

**Example 1:**

**71%**

$\frac{5}{7}$ = 0.7142857 x 100 = 71.4 or

**Example 2:**

**67%**

$\frac{2}{3}$ = 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.

$ \frac{16}{24}$ ***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.

$$\frac{2}{3}$$

 $\frac{16÷8}{24÷8}$ =

**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.**

$\frac{24}{56}$ = $\frac{2 x 2 x 2 x 3}{2 x 2 x 2 x 7}$

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.

$$\frac{3}{7}$$

1. 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***.

 $\frac{1}{4}$

+ $\frac{2}{4}$

$$\frac{3}{4}$$

**Addition of Fractions with Unlike Denominators**

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

 $\frac{1}{4}$ 4, 8, , 12, , , 16

 + $\frac{2}{6}$ 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

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

 + $\frac{2\*2}{6\*2}$ = $\frac{4}{12}$

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

 $\frac{3}{12}$

 + $\frac{4}{12}$

$$\frac{7}{12}$$

**Adding Mixed Numbers with like denominators**

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

$1\frac{3}{5}$

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

 2

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

$1\frac{3}{5}$

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

2 $\frac{4}{5}$

**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$\frac{2x2}{3x2}$ = 2 $\frac{4}{6}$

 +$1\frac{1}{6}$ = $1\frac{1}{6}$

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

2 $\frac{4}{6}$

 +$1\frac{1}{6}$

$$3\frac{5}{6}$$

**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$\frac{1x2}{2x2}$ = 1 $\frac{2}{4}$

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

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

 1 $\frac{2}{4}$

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

 $5\frac{5}{4}$

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

$\frac{5}{4}$ becomes $1\frac{1}{4}$ so…***ADD*** the 1 WHOLE to the 5 WHOLES to get 6 WHOLES.

$$6\frac{1}{4}$$

 $5\frac{5}{4}$ *becomes*

**Subtraction of Fractions with like Denominators**

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

 $\frac{3}{4}$

- $\frac{1}{4}$

$\frac{2}{4}$ or $\frac{1}{2}$

**Subtraction of Fractions with Unlike Denominators**

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

 $\frac{2}{4}$ 4, 8, , 12, , , 16

 - $\frac{2}{6}$ 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.

 $\frac{2\*3}{4\*3}$ = $\frac{6}{12}$

 - $\frac{2\*2}{6\*2}$ = $\frac{4}{12}$

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

 $\frac{6}{12}$

 - $\frac{4}{12}$

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

**Subtracting Mixed Numbers with like denominators**

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

$$3\frac{3}{4}$$

* $1\frac{1}{4}$

 2

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

$$3\frac{3}{4}$$

* $1\frac{1}{4}$

2$\frac{2}{4}$ or 2$\frac{1}{2}$

**Subtracting Mixed Numbers with like denominators…**

**If you cannot subtract numerators**

\* If you start with the following fractions:

$4\frac{5}{8}$

 - $3\frac{7}{8}$

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

 4$ \frac{5}{8}$ = $\frac{37}{8}$

 - $3\frac{7}{8}$ = $\frac{31}{8}$

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

 $\frac{37}{8}$

 - $\frac{31}{8}$

$\frac{6}{8}$ or $\frac{3}{4}$

**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**

$1. 7\frac{1}{4}$ - $ 3\frac{3}{4}$ =

2. $6\frac{5}{4}$ - $3\frac{3}{4}$ =

$3\frac{2}{4}$ or $3\frac{1}{2}$

**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$\frac{2x2}{3x2}$ = 2 $\frac{4}{6}$

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

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

2 $\frac{4}{6}$

$ - 1\frac{2}{6}$

$1\frac{2}{6}$ or $1\frac{1}{3}$

**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**

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

$4\frac{4}{4}$ - $1\frac{3}{4}$ =

$3\frac{1}{4}$

**Estimating Products of Fractions**

Estimate: **3 x** $6\frac{4}{5}$

***Remember***… When the fractional part is **greater than or equal to** $\frac{1}{2}$ you round the whole number up…**less than** $\frac{1}{2}$keep it the same.

* $6\frac{4}{5}$ = greater than $\frac{1}{2}$ so you would round the 6 to **7** wholes

 21

* 3 x 7 =

Estimate: $\frac{3}{4}$ 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: $\frac{3}{4}$ x **20**

$× \frac{3}{4}$ 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***.

$\frac{2}{5}$ \* $\frac{3}{4}$ = $\frac{6}{?}$

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

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

$\frac{6}{20}$ or $\frac{3}{10}$

**Multiplying Fractions and Whole Numbers**

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

$\frac{1}{4}$ \* 3 becomes $\frac{1}{4}$ \* $\frac{3}{1}$

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

$\frac{1}{4}$ \* $\frac{3}{1}$ = $\frac{3}{?}$

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

$$\frac{3}{4}$$

$\frac{1}{4}$ \* $\frac{3}{1}$ = $\frac{3}{4}$

\* 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***.

$2\frac{1}{3}$ \* $2\frac{1}{2}$ becomes $\frac{7}{3}$ \* $\frac{5}{2}$

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

$\frac{7}{3}$ \* $\frac{5}{2}$ = $\frac{35}{?}$

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

$\frac{7}{3}$ \* $\frac{5}{2}$ = $\frac{35}{6}$

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

$$5\frac{5}{6}$$

 $\frac{35}{6}$ becomes

**Dividing Fractions**

\* If you start with the fractions:

$\frac{3}{4}$$÷$$\frac{1}{8}$

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

$\frac{3}{4}$$÷$$\frac{8}{1}$

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

$\frac{3}{4}$$\*$$\frac{8}{1}$ **=** $\frac{24}{4}$

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

6

 $\frac{24}{4}$ =

**Fraction of Fraction Problems**

 **HINT!! “OF” in math = MULTIPLY**

1. **What is** $\frac{1}{2}$ **of 3? (HINT!! put the whole number over 1)**

$$1\frac{1}{2}$$

$\frac{1}{2}$ \* $\frac{3}{1}$ = $\frac{3}{2}$ change to a ***mixed number***

1. **What is** $\frac{1}{4}$ **of** $\frac{1}{2}$ **?**

$$\frac{1}{8}$$

$\frac{1}{4}$ \* $\frac{1}{2}$ =

1. **What is** $\frac{2}{3}$ **of 12?**

8

$\frac{2}{3}$ \* $\frac{12}{1}$ = $\frac{24}{3}$ 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***.

$\frac{2}{3}$ of 21

 $÷$

 21 ÷ 3 = 7

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

 $×$ $\frac{2}{3}$ 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 $\frac{2}{3}$ of the set?

$× \frac{2}{3}$ of 21 = 14

 $ ÷$

 To find a ***WHOLE…***

Example: If 9 counters are $\frac{3}{7}$ of the set, how many counters are in the whole set?

 $ ÷$

$× \frac{3}{7}$ 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: $\frac{1}{2}$ = $\frac{5}{10}$

**Improper Fraction:** A fraction where the numerator is bigger than the denominator. A “top-heavy” fraction. Example: $\frac{12}{5}$

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

Example: $2\frac{3}{4}$

**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:$\frac{1}{4}$, $\frac{1}{9}$, $\frac{1}{3}$

**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:**