

## FRACTION WORKSHOP

### Parts of a Fraction:

Numerator – the top of the fraction.

Denominator – the bottom of the fraction.

Example:

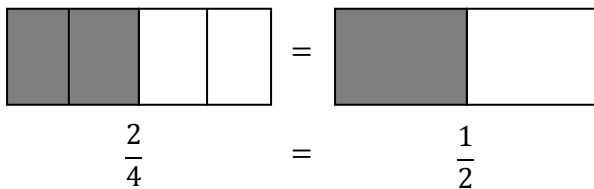
In the fraction  $\frac{3}{8}$  the numerator is 3 and the denominator is 8.

### Equivalent Fractions:

Equivalent Fractions – fractions that have the same numerical value even if they appear to be different.

Example:

As seen in the shaded figures below,  $\frac{2}{4}$  is equivalent to  $\frac{1}{2}$  since they both clearly represent half of the figure.



Creating Equivalent Fractions:

To obtain equivalent fractions, either multiply both numerator **and** denominator by the same number (**building fractions**), or divide both the numerator **and** denominator by the same number (**simplifying fractions**).

Examples:

Building Fractions:

Find the missing numerator that will create an equivalent fraction:  $\frac{2}{7} = \frac{?}{28}$

Ask: "What did I multiply the denominator by to get the new denominator?"

Then multiply numerator by that same number to get the missing numerator as shown below.

$$\frac{2}{7} \cdot \frac{4}{4} = \frac{8}{28}$$

The missing numerator is 8.

Note: Building fractions is a necessary skill that is needed when adding and subtracting fractions which do not have a common denominator.

Simplifying Fractions:

To write fractions in their simplest form, the numerator and denominator must be divided by the **greatest common factor (GCF)** of the numerator and denominator.

Write the following fraction in its simplest form:  $\frac{12}{18}$

Ask: "What is the GCF of my numerator & denominator?" (The GCF of 12 & 18 is 6) Then divide both the numerator & denominator by that number to obtain the fraction in its simplest form as shown below.

$$\frac{12 \div 6}{18 \div 6} = \frac{2}{3}$$

### Adding & Subtracting Fractions with Common Denominator:

To add or subtract fractions with a common denominator, simply add or subtract the numerators and place the result over the common denominator. Then write the sum or difference in its simplest form.

Examples:

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

$$\frac{8}{9} - \frac{1}{9} = \frac{8-1}{9} = \frac{7}{9}$$

### Least Common Denominator

Least Common Denominator (LCD) – Least common multiple of the denominators.

To find the LCD of two or more fractions, do the prime factorization of each denominator, use each factor the highest number of times it occurs in one set of factors, and multiply those factors together.

Example:

Find the LCD of the following fractions:

$$\frac{1}{24} \quad \& \quad \frac{1}{60}$$

$$24 = 2 \cdot 2 \cdot 2 \cdot 3 \text{ (three 2's \& one 3)}$$

$$60 = 2 \cdot 2 \cdot 3 \cdot 5 \text{ (two 2's, one 3, \& one 5)}$$

$$\text{LCD} = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 = 120$$

$$\text{(three 2's, one 3, \& one 5)}$$

The LCD is 120.

### Adding & Subtracting Fractions with Different Denominator:

To add or subtract fractions with different denominators:

1. Find the LCD of all the fractions to be added or subtracted.
2. Rewrite the fractions as equivalent fractions (**build** them) with the LCD as their denominators.
3. Add or subtract the new numerators and place the sum or difference over the LCD.
4. Write the resulting fraction in its simplest form.

Examples:

A.  $\frac{7}{8} + \frac{5}{12}$

1. LCD: 24

2.  $\frac{7}{8} \cdot \frac{3}{3} + \frac{5}{12} \cdot \frac{2}{2} = \frac{21}{24} + \frac{10}{24}$

3.  $\frac{21+10}{24} = \frac{31}{24}$

4.  $\frac{31}{24}$

B.  $\frac{7}{8} - \frac{1}{4}$

1. LCD: 24

2.  $\frac{7}{8} \cdot \frac{3}{3} - \frac{1}{4} \cdot \frac{6}{6} = \frac{21}{24} - \frac{6}{24}$

3.  $\frac{21-6}{24} = \frac{15}{24}$

4.  $\frac{5}{8}$

### Multiplication of Fractions:

To multiply fractions, simply multiply the numerators together and the denominators together. Then write the product in its simplest form. Canceling may be used to eliminate common factors prior to multiplication.

Example:

$$\frac{3}{4} \cdot \frac{14}{15} = \frac{3 \cdot 14}{4 \cdot 15} = \frac{42}{60} = \frac{42 \div 6}{60 \div 6} = \frac{7}{10}$$

or

$$\frac{\cancel{3} \cdot \cancel{14} 7}{\cancel{4} \cdot \cancel{15} 5} = \frac{7}{10}$$

### Division of Fractions:

To divide fractions, multiply the first fraction by the reciprocal of the second fraction.

Example:

$$\frac{8}{9} \div \frac{2}{3} = \frac{8}{9} \cdot \frac{3}{2} = \frac{4}{3}$$

Note: When multiplying or dividing fractions by whole numbers, write the whole number as a fraction by placing it over one.

### Mixed Number Operations:

Adding & Subtracting Mixed Numbers:

When adding or subtracting mixed numbers, you can either change the mixed numbers to improper fractions first & then add or subtract according to the rules for adding and subtracting fractions, or you can add or subtract the whole number parts separately borrowing or carrying as necessary.

Examples:

A.  $4\frac{2}{9} + 3\frac{2}{3}$

$$\frac{38}{9} + \frac{11}{3}$$

$$\frac{38}{9} + \frac{33}{9} = \frac{71}{9} = 7\frac{8}{9}$$

B.  $3\frac{1}{5} - 1\frac{5}{8}$

$$3\frac{8}{40} - 1\frac{25}{40}$$

Borrow 1 from the 3  
and add to  $\frac{8}{40}$  as  $\frac{40}{40}$ .

$$2\frac{48}{40} - 1\frac{25}{40} = 1\frac{23}{40}$$

### Ordering Fractions:

To compare or order fractions, build all the fractions as equivalent fractions with the LCD as the denominator for each. Then compare or order them, based on their numerators. Write the results in simplest form.

Examples:

A. Write the following fractions in order from least to greatest:  $\frac{2}{3}, \frac{7}{6}, \frac{3}{5}$

1.  $\frac{2}{3} = \frac{20}{30}, \frac{7}{6} = \frac{35}{30}, \frac{3}{5} = \frac{18}{30}$

2.  $\frac{3}{5}, \frac{2}{3}, \frac{7}{6}$

B. Write the symbol, < or > between the following fractions to make a true statement:  $\frac{5}{8} \square \frac{9}{14}$

1.  $\frac{5}{8} \cdot \frac{7}{7} = \frac{35}{56}, \frac{9}{14} \cdot \frac{4}{4} = \frac{36}{56}$

2.  $\frac{5}{8} < \frac{9}{14}$

## FRACTION WORKSHOP PRACTICE PROBLEMS

- Find the GCF of 32 and 60.
- Find the LCD of  $\frac{5}{8}$  and  $\frac{13}{20}$ .
- Express the shaded portion of the rectangles as an improper fraction.
- Write  $\frac{10}{3}$  as a mixed number.
- Write  $5\frac{5}{12}$  as an improper fraction.
- Write an equivalent fraction with the given denominator:  $\frac{5}{8} = \frac{?}{56}$
- Write  $\frac{12}{80}$  in simplest form.
- Add:  $\frac{7}{12} + \frac{5}{16}$
- Add:  $\frac{5}{8} + \frac{7}{8}$
- Add:  $2\frac{7}{8} + 1\frac{7}{12}$
- A carpenter built a header by nailing a  $1\frac{7}{8}$ -inch board to a  $4\frac{1}{2}$ -inch beam. Find the total thickness of the header.
- Subtract:  $\frac{9}{10} - \frac{3}{10}$
- Subtract:  $5\frac{3}{8} - 2\frac{11}{12}$
- What is the difference between  $\frac{7}{10}$  and  $\frac{4}{15}$ ?
- A mechanic cuts lengths of  $5\frac{1}{4}$  inches and  $3\frac{2}{3}$  inches of radiator hose from a roll containing 36 inches. Find the amount of radiator hose remaining on the roll.
- Multiply:  $\frac{5}{12} \times \frac{8}{15}$
- What is the product of  $6\frac{2}{3}$  and  $4\frac{4}{5}$ ?
- A plumber earns \$174 for each day worked. What are the plumber's earnings for working  $3\frac{1}{2}$  days?
- Divide:  $\frac{7}{9} \div \frac{14}{27}$
- Find the quotient of  $3\frac{5}{12}$  and  $2\frac{1}{4}$ .
- A package contains 18 ounces of granola. How many  $1\frac{1}{2}$ -ounce portions can be served from this package?
- Write the symbol,  $<$  or  $>$  between the following fractions to make a true statement:  $\frac{23}{36} \square \frac{17}{24}$
- Simplify:  $\frac{7}{8} - \frac{3}{4} \cdot \frac{8}{9}$
- Simplify:  $\left(\frac{2}{3}\right)^2 \div \left(\frac{1}{2} + \frac{2}{3}\right)$
- Simplify:  $\frac{1}{6} + \left(\frac{1}{3} - \frac{3}{10}\right) \div \frac{7}{15}$

**Practice Problems Answers:**

1. 4

2. 40

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

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

5.  $\frac{65}{12}$

6.  $\frac{35}{56}$

7.  $\frac{3}{20}$

8.  $\frac{3}{2}$  or  $1\frac{1}{2}$

9.  $\frac{43}{48}$

10.  $4\frac{11}{24}$

11.  $6\frac{3}{8}$  in

12.  $\frac{3}{5}$

13.  $2\frac{11}{24}$

14.  $\frac{13}{30}$

15.  $27\frac{1}{12}$  in

16.  $\frac{2}{9}$

17. 32

18. \$609

19.  $\frac{3}{2}$  or  $1\frac{1}{2}$

20.  $\frac{41}{27}$  or  $1\frac{14}{27}$

21. 12  $1\frac{1}{2}$ -ounce portions

22. <

23.  $\frac{5}{24}$

24.  $\frac{8}{21}$

25.  $\frac{5}{21}$