Fractions

I. Fraction Definitions

Proper Fraction $\frac{3}{4}$ $\frac{9}{5}$

Improper Fraction

Mixed Number $2\frac{6}{7}$

II. Converting Improper Fractions to Mixed Numbers

1) Divide the numerator by the denominator
2) Write the quotient as a whole number
3) Write the remainder over the divisor – as a fraction

Example 1:

$\frac{17}{3}$

$17 \div 3 = 5\ R\ 2$

$\frac{17}{3} \quad \frac{2}{3} \quad 20 \qquad \frac{\ }{\ } = 5\frac{\ }{\ }$

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

$17 \div 3 = 5\ R2 = 5\frac{2}{3}$

Example 2:

$\frac{20}{4}$

$20 \div 4 = 5$

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

$20 \div 4 = 5$

III. Converting Mixed Numbers to Improper Fractions

1) Multiply the whole number by the denominator
2) Add the numerator
3) Place the result over the denominator

Example 1:

$2\frac{3}{4}$

$\frac{(4 \cdot 2) + 3}{4}$

$\frac{8 + 3}{4} \quad \frac{\ }{\ } = \frac{11}{4}$

Example 2:

12

$\frac{12}{1}$

IV. Reducing Fractions

- To reduce a fraction to lowest terms remove any factors common to both the numerator and denominator.

Example 1:

Example 2:

$$\frac{6}{10} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 5} = \frac{3}{5} \qquad 24 = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{3}}{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot \cancel{3}} = 2$$

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V. Multiplying Fractions and Mixed Numbers

1) **All terms must be fractions** – no whole numbers and no mixed numbers
2) It is easier to reduce before you multiply, but you don't have to
3) Multiply straight across
4) If you didn't reduce in Step 2, reduce now
5) Simplify

Example 1:

$$\frac{1}{2} \cdot \frac{2}{3} = \frac{1}{1} \cdot$$

12

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

1

3

Step 1.

Step 2.

Step 3.

Step 5.

Example 2:

$$2\frac{2}{3} \cdot 6 = \frac{8}{3} \cdot \frac{2 \cdot 3}{1} = \frac{8}{1} \cdot \frac{16}{1} = 16$$

$$16 \div 1 = 16$$

VI. Dividing Fractions and Mixed Numbers

REMEMBER: Dividing Fractions is easy as pie, flip the second and multiply.

Example 1:

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

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

$$9 \div 8 = 1\,R1 = 1\frac{1}{8}$$

Example 2:

$$2\frac{1}{10} \div 5\frac{3}{5}$$

$$\frac{20+1}{10} \div \frac{25+3}{5}$$

$$\frac{21}{10} \cdot \frac{5}{28} = \frac{3 \cdot \cancel{7}}{2 \cdot \cancel{5}} \cdot \frac{\cancel{5}}{2 \cdot 2 \cdot \cancel{7}}$$

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

VII. Adding and Subtracting Fractions (like denominators)

1) Add or subtract numerators
2) Place results over the common denominator 3) Simplify

Example 1:

$$\frac{5}{14} \quad \frac{3}{14} \quad \frac{5}{14} \quad \frac{3}{14}$$

$$\frac{8}{14} \quad \frac{2}{14}$$

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

Example 2:

$$\frac{+}{14} \quad \frac{}{14} \quad -$$

$$\frac{}{14}$$

$$\frac{2}{2 \cdot 7} \quad \frac{1}{7} = \frac{}{}$$

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VIII. Adding and Subtracting Fractions (unlike denominators)

1) Find LCD of all fractions
2) Change each fraction to make their denominators the same as the LCD
3) Add or subtract numerators and place over the common denominator
4) Simplify

Example 1:

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

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

$$\frac{3}{12} \quad \frac{8}{12} \quad +$$

$$\frac{11}{12} \quad 1$$

Example 2:

$$\frac{4}{5} \quad \frac{3}{10} \quad -$$

$$\frac{4 \cdot 2}{5 \cdot 2} \quad \frac{3}{10} \quad -$$

$$\frac{8}{10} - \frac{3}{10}$$

$$\frac{5}{10}$$

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

$$\frac{}{2} \quad \frac{}{2}$$

IX. Adding Mixed Numbers – Method A

1) Find LCD of all fractions
2) Change each fraction to make their denominators the same as the LCD
3) Add the fractional parts and simplify
4) Add the whole number parts
5) Combine the results and simplify

Example 1:

$$3$$

Example 2:

$$\frac{5}{} \quad \frac{5}{}$$

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

$22\frac{3}{8} + 30\frac{4}{8} = 52\frac{7}{8} = 52 + 1\frac{3}{8} = 53\frac{3}{8}$

Method B

1) Change mixed numbers to improper fractions
2) Find LCD of all fractions
3) Change each fraction to make their denominators the same as the LCD
4) Add numerators and place over the common denominator 5) Simplify

Example 1:

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

$\frac{12+3}{4} + \frac{8+1}{4}$

$\frac{15}{4} + \frac{9}{4} = \frac{24}{4}$

$24 \div 4 = 6$

Example 2:

$22\frac{5}{8} + 30\frac{3}{4}$

$\frac{176+5}{8} + \frac{120+3}{4}$

$\frac{181}{8} + \frac{123 \cdot 2}{4 \cdot 2}$

$\frac{181}{8} + \frac{246}{8} = \frac{427}{8}$

$427 \div 8 = 53\ R3 = 53\frac{3}{8}$

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X. Subtracting Mixed Numbers – Method A

1) Find LCD of all fractions
2) Change each fraction to make their denominators the same as the LCD
3) Subtract the fractional parts and simplify
4) Subtract the whole number parts 5) Combine the results and simplify

Example 1:

$5\frac{3}{8} = 4 + 1\frac{3}{8} = 4\frac{11}{8}$

$\frac{7}{8} \quad \frac{7}{8} \quad \frac{7}{8}$

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

Example 2:

$36\frac{3}{4} = 36\frac{6}{8}$

$\frac{3}{4} \quad \frac{3}{8}$

$14\frac{3}{8}$

$8 \quad 2$

$-\ 2 = 2$

$= 2$

$-\ 22 = 22$

Method B

1) Change mixed numbers to improper fractions
2) Find LCD of all fractions
3) Change each fraction to make their denominators the same as the LCD
4) Subtract numerators and place over the common denominator 5) Simplify

Example 1:

$5\ \frac{3}{8} \qquad \frac{7}{8} \qquad -\ 2$

$\frac{40+3}{8} - \frac{16+7}{8}$

$\frac{43}{8} - \frac{23}{8}$

$\frac{20}{8}$

Example 2:

$36 \qquad -\ 22$

$\frac{144+3}{4} - \frac{176+3}{8}$

$\frac{147}{4} - \frac{179}{8}$

$\frac{147 \cdot 2}{4 \cdot 2} - \frac{179}{8}$

$8 \quad 8 \quad 8 \quad 8$

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

$R4 = 2\ \_ \qquad - \qquad =$

$4 \quad 294$

$115 \div 8 = 14\ R3 = 14\ \frac{3}{8}$

$179 \quad 115\ 20 \div 8 = 2$