Fraction Lesson + Homework

EQUIVALENT (OR EQUAL) FRACTIONS

RULE: Multiplying the numerator AND denominator by the SAME number does NOT change the value of the fraction

For example,

$$\frac{1}{2}=\frac{1\times 2}{2\times 2}=\frac{2}{4} \qquad \frac{1}{2}=\frac{1\times 3}{2\times 3}=\frac{3}{6} \qquad \frac{1}{2}=\frac{1\times 4}{2\times 4}=\frac{4}{8} \qquad \frac{1}{2}=\frac{1\times y}{2\times y}=\frac{y}{2y}$$

BUT, $\frac{1}{2}$ is said to be in LOWEST TERMS.

Example 3: Fill in the blanks.

a) $\frac{5}{7}=\frac{30}{42}$ b) $\frac{7}{12}=\frac{28}{48}$ c) $\frac{5}{6}=\frac{15}{18}$ d) $3=\frac{33}{11}$

REDUCING TO LOWEST TERMS

RULE: Answers that are fractions MUST ALWAYS be reduced to lowest terms.

$$\frac{20}{35}=\frac{4\times 5}{7\times 5}=\frac{4}{7} \qquad \frac{18}{24}=\frac{3\times 6}{4\times 6}=\frac{3}{4}$$

The middle steps are usually done mentally and need not be shown.

To reduce a fraction, DIVIDE the numerator and denominator by the GREATEST COMMON FACTOR of the numerator and denominator. Recall: *factors* are numbers that a number can be divided by to produce a whole number.

Example 4: Reduce to lowest terms.

a) $\frac{10}{15}\overset{\div 5}{\underset{\div 5}{}}=\frac{2}{3}$ b) $\frac{7}{21}\overset{\div 7}{\underset{\div 7}{}}=\frac{1}{3}$ c) $\frac{18}{45}\overset{\div 9}{\underset{\div 9}{}}=\frac{2}{5}$ d) $\frac{40}{15}\overset{\div 5}{\underset{\div 5}{}}=\frac{8}{3}$

NOTE: Larger numbers may require more steps.

e) $\frac{105}{135}\overset{\div 5}{\underset{\div 5}{}}=\frac{21}{27}\overset{\div 3}{\underset{\div 3}{}}=\frac{7}{9}$

f) $\frac{168}{120}\overset{\div 4}{\underset{\div 4}{}}=\frac{42}{30}\overset{\div 2}{\underset{\div 2}{}}=\frac{21}{15}\overset{\div 3}{\underset{\div 3}{}}=\frac{7}{5}$

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MIXED AND IMPROPER FRACTIONS

An expression of the form $2\frac{3}{5}$ means $2 + \frac{3}{5}$ and is called a **MIXED FRACTION**.

An **IMPROPER FRACTION** is a fraction such that the numerator is greater than the denominator. For example, $\frac{3}{2}$.

RULE: To convert mixed fractions to improper fractions, multiply the whole number with the denominator, add the numerator and put the answer over the denominator.

For example, $2\frac{3}{5} = \frac{2\times5+3}{5} = \frac{13}{5}$ $\quad$ $3\frac{2}{7} = \frac{3\times7+2}{7} = \frac{23}{7}$

Again, the middle steps are usually done mentally and need not be shown.

Example 5: Convert to improper fractions.

a) $4\frac{1}{6}$ $\quad$ b) $5\frac{3}{4}$ $\quad$ c) $8\frac{2}{3}$

$= \frac{6\times4+1}{6}$ $\quad$ $= \frac{4\times5+3}{4}$ $\quad$ $= \frac{8\times3+2}{3}$

$= \frac{25}{6}$ $\quad$ $= \frac{23}{4}$ $\quad$ $= \frac{26}{3}$

NOTE: Convert mixed fractions to improper fractions first before completing any operations, such as multiplying, dividing, adding or subtracting.

NOTE: Answers are never given as mixed fractions unless the question specifically says to do so. ALL answers should be in **LOWEST TERMS**.

MULTIPLYING FRACTIONS

RULE ONE: To multiply fractions that have no common factors, multiply the numerators and multiply the denominators.

For example, $\frac{2}{3}\times\frac{5}{7} = \frac{2\times5}{3\times7} = \frac{10}{21}$ $\quad$ $\frac{4}{9}\times\frac{2}{5} = \frac{8}{45}$

Example 6: Multiply the following fractions.

a) $\frac{1}{5}\times\frac{2}{11} = \frac{2}{55}$ $\quad$ b) $\frac{7}{11}\times\frac{4}{5} = \frac{28}{55}$ $\quad$ c) $\frac{7}{9}\times5 = \frac{7}{9}\times\frac{5}{1}$ $= \frac{35}{9}$

d) $\frac{2}{3}\times\frac{5}{7}\times\frac{8}{3} = \frac{80}{63}$ $\quad$ e) $\left(\frac{4}{7}\right)^2 = \frac{4}{7}\times\frac{4}{7}$ $= \frac{16}{49}$ $\quad$ f) $2\frac{3}{4}\times1\frac{1}{2} = \frac{11}{4}\times\frac{3}{2}$ $= \frac{33}{8}$

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RULE TWO: To multiply fractions that have common factors, **REDUCE FIRST,** then multiply. We can reduce up, down or diagonally.

For example, $\frac{3}{5}\times\frac{4}{9}=\frac{1}{5}\times\frac{4}{3}=\frac{4}{15}$ $\qquad$ $\frac{15}{8}\times\frac{12}{21}=\frac{15}{2}\times\frac{1}{7}=\frac{15}{14}$

Example 7: Reduce first then multiply.

a) $\frac{4}{15}\times\frac{9}{16}=\frac{1}{5}\times\frac{3}{4}=\frac{3}{20}$ $\qquad$ b) $\frac{5}{8}\times\frac{56}{20}=\frac{1}{4}\times\frac{7}{1}=\frac{7}{4}$ $\qquad$ c) $\frac{6}{8}\times\frac{12}{5}\times\frac{15}{21}=\frac{3}{1}\times\frac{1}{1}\times\frac{3}{7}=\frac{9}{7}$

d) $\frac{12}{35}\times\frac{14}{9}\times\frac{39}{22}=\frac{4}{5}\times\frac{1}{1}\times\frac{13}{11}=\frac{52}{55}$

DIVIDING FRACTIONS

Dividing fractions involves taking the RECIPROCAL or INVERSE of a fraction.

RECIPROCAL or INVERSE of a fraction:

The reciprocal of $\frac{5}{7}$ is $\frac{7}{5}$

The reciprocal of $\frac{1}{2}$ is $\frac{2}{1}$

The reciprocal of 8 is $\frac{1}{8}$

RULE: To divide by a fraction:

1. Change the ÷ to a ×
2. Take the reciprocal of the fraction AFTER the ÷
3. Reduce and multiply

Alternatively, the above steps can be re-stated as: When dividing by a fraction, multiply by the reciprocal.

For example, $\frac{3}{4}\div\frac{5}{7}=\frac{3}{4}\times\frac{7}{5}=\frac{21}{20}$

$\frac{5}{6}\div\frac{3}{8}=\frac{5}{6}\times\frac{8}{3}=\frac{20}{9}$

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Homework

To be completed without a calculator.

1. Write the missing information to form equivalent fractions.

a) $\frac{1}{3} = \frac{\quad}{18}$ b) $\frac{\quad}{28} = \frac{4}{7}$ c) $\frac{3}{8} = \frac{15}{\quad}$

d) $\frac{1}{\quad} = \frac{9}{36}$ e) $\frac{3}{\quad} = \frac{15}{55}$ f) $\frac{5}{35} = \frac{\quad}{7}$

2. Add.

a) $\frac{3}{8} + \frac{1}{8}$ b) $\frac{1}{3} + \frac{1}{6}$ c) $\frac{1}{3} + \frac{5}{12}$

3. Subtract.

a) $\frac{7}{15} - \frac{2}{5}$ b) $\frac{3}{4} - \frac{1}{6}$ c) $\frac{1}{3} - \frac{1}{6}$

4. Add.

a) $1\frac{1}{6} + 2\frac{1}{6}$ b) $3\frac{3}{4} + 1\frac{3}{4}$ c) $1\frac{3}{4} + 2\frac{5}{12}$

5. Subtract.

a) $3\frac{3}{10} - 1\frac{7}{10}$ b) $2 - 1\frac{1}{4}$ c) $2\frac{3}{7} - 1\frac{6}{7}$

6. Multiply.

a) $\frac{1}{2} \times \frac{3}{5}$ b) $\frac{3}{5} \times 15$ c) $\frac{3}{4} \times \frac{8}{15}$ d) $2\frac{1}{3} \times \frac{3}{14}$

7. Divide.

a) $\frac{3}{7} \div \frac{4}{5}$ b) $\frac{3}{4} \div \frac{7}{8}$ c) $4 \div \frac{8}{9}$ d) $\frac{5}{7} \div 10$

8. Arrange the fractions in order from least to greatest in value.

a) $\frac{3}{4}, \frac{5}{8}, \frac{1}{2}$ b) $\frac{3}{5}, \frac{9}{10}, \frac{3}{4}$

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Answers

1.

a) 6 b) 16 c) 40

d) 4 e) 11 f) 1

2.

a) $\frac{1}{2}$ b) $\frac{1}{2}$ c) $\frac{3}{4}$

3.

a) $\frac{1}{15}$ b) $\frac{7}{12}$ c) $\frac{1}{6}$

4.

a) $3\frac{1}{3}$ b) $5\frac{1}{2}$ c) $4\frac{1}{6}$

5.

a) $1\frac{3}{5}$ b) $\frac{3}{4}$ c) $\frac{4}{7}$

6.

a) $\frac{3}{10}$ b) 9 c) $\frac{2}{5}$ d) $\frac{1}{2}$

7.

a) $\frac{15}{28}$ b) $\frac{6}{7}$ c) $\frac{9}{2}$ d) $\frac{1}{14}$

8.

a) $\frac{1}{2}, \frac{5}{8}, \frac{3}{4}$ b) $\frac{3}{5}, \frac{3}{4}, \frac{9}{10}$