# EQUIVALENT (OR EQUAL) FRACTIONS

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

For example,

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

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

Example 3: Fill in the blanks.

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

#### **REDUCING TO LOWEST TERMS**

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

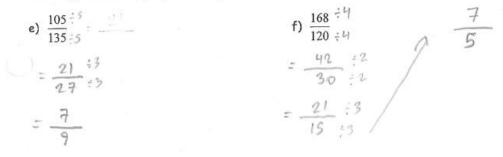
The middle steps are usually done mentally and need not be shown.

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) 
$$\frac{10^{+5}}{15!5} = \frac{2}{3}$$
 b)  $\frac{7^{+7}}{21!^{+7}} = \frac{1}{3}$  c)  $\frac{18^{+9}}{45!^{+9}} = \frac{2}{5}$  d)  $\frac{40^{+5}}{15!^{+5}} = \frac{3}{3}$ 

NOTE: Larger numbers may require more steps.



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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,  $\frac{3}{2}$ 

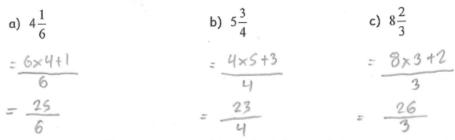
RULE: To convert mixed fractions to improper fractions, multiply the whole number with the denominator, add the numerator and put the answer over the denominator.

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

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

Example 5: Convert to improper fractions.



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, 
$$\frac{2}{3} \times \frac{5}{7} = \frac{2 \times 5}{3 \times 7} = \frac{10}{21}$$
  $\frac{4}{9} \times \frac{2}{5} = \frac{8}{45}$ 

Example 6: Multiply the following fractions.

a) 
$$\frac{1}{5} \times \frac{2}{11} = \frac{2}{55}$$
  
b)  $\frac{7}{11} \times \frac{4}{5} = \frac{29}{55}$   
c)  $\frac{7}{9} \times \frac{5}{5} = \frac{7}{9} \times \frac{6}{1}$   
 $= \frac{35}{9}$   
d)  $\frac{2}{3} \times \frac{5}{7} \times \frac{8}{3} = \frac{30}{63}$   
e)  $\left(\frac{4}{7}\right)^2 = \frac{4}{7} \times \frac{4}{7}$   
f)  $2\frac{3}{4} \times 1\frac{1}{2} = \frac{11}{4} \times \frac{3}{2}$   
 $= \frac{16}{49}$   
 $= \frac{33}{8}$ 

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

For example, 
$$\frac{3}{5} \times \frac{4}{9} = \frac{1}{5} \times \frac{4}{3} = \frac{4}{15}$$
  
Example 7: Reduce first then multiply.  
a)  $\frac{4}{15} \times \frac{9}{16} = \frac{1}{5} \times \frac{3}{4}$   
b)  $\frac{5}{8} \times \frac{56}{20} = \frac{14}{14} \times \frac{17}{16}$   
c)  $\frac{3}{8} \times \frac{12}{5} \times \frac{15}{21} = \frac{3}{12} \times \frac{1}{14} \times \frac{3}{7}$   
d)  $\frac{12}{15} \times \frac{14}{9} \times \frac{13}{22} = \frac{4}{5} \times \frac{1}{1} \times \frac{13}{11}$ 

# 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  $\frac{7}{1}$   
The reciprocal of 8 is  $\frac{1}{8}$ 

RULE: To divide by a fraction:

- 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,	$\frac{3}{4} \div \frac{5}{7} = \frac{3}{4} \times \frac{7}{5}$	$\frac{5}{6} \div \frac{3}{8} = \frac{5}{6} \times \frac{8}{3}$
	$=\frac{21}{20}$	$=\frac{20}{9}$

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÷.,

# Homework

To be completed without a calculator.

1. Write the missing information to form equivalent fractions.								
a) $\frac{1}{3} = \frac{1}{18}$	b) $\frac{1}{28} =$	4 7	c)	$\frac{3}{8} = \frac{15}{15}$				
d) $\frac{1}{36} = \frac{9}{36}$	e) <del>3</del> = -	<u>15</u> 55	f)	$\frac{5}{35} = \frac{1}{7}$				
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.		3		3 5				
a) $1\frac{1}{6} + 2\frac{1}{6}$	b) $3\frac{3}{4}$ +	$1\frac{2}{4}$	c)	$1\frac{3}{4} + 2\frac{5}{12}$				
5. Subtract.								
		. 1		o <sup>3</sup> , <sup>6</sup>				
a) $3\frac{3}{10} - 1\frac{7}{10}$	b) 2 – 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) $2\frac{1}{2} \times \frac{3}{14}$				
a) $\frac{1}{2} \times \frac{1}{5}$	b) - x 15	c) $\frac{-4}{4} \times \frac{15}{15}$		a) $2{3} \times {14}$				
7. Divide.								
a) $\frac{3}{7} \div \frac{4}{5}$	b) $\frac{3}{4} \div \frac{7}{8}$	a) 4 i <sup>8</sup>		d) <sup>5</sup> , 10				
$a) \frac{7}{7} \frac{1}{5}$	4 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.								
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a)  $\frac{3}{4}, \frac{5}{8}, \frac{1}{2}$  b)  $\frac{3}{5}, \frac{9}{10}, \frac{3}{4}$ 

# Answers

1.					
a) 6		b) 16		c)	40
d) 4		e) 11		f)	1
2.					
a) $\frac{1}{2}$		b) $\frac{1}{2}$		c)	3 4
3.					
a) $\frac{1}{15}$		b) $\frac{7}{12}$		c)	<u>1</u> 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)	4 7
6.					
a) $\frac{3}{10}$	b) 9		c) $\frac{2}{5}$		d) $\frac{1}{2}$
7.					
a) $\frac{15}{28}$	b) <sup>6</sup> / <sub>7</sub>		c) $\frac{9}{2}$		d) $\frac{1}{14}$
8.					
a) $\frac{1}{2}, \frac{5}{8}, \frac{3}{4}$			b) $\frac{3}{5}, \frac{3}{4}, \frac{9}{10}$		