

**AT THE END OF THIS COURSE YOU MUST BE ABLE TO:**

CONVERT ARABIC NUMBERS TO ROMAN NUMERALS  
CONVERT ROMAN NUMERALS TO ARABIC NUMBERS

GIVE DEFINITION OF A COMMON FRACTION  
IDENTIFY TYPES OF FRACTIONS  
CHANGE IMPROPER FRACTIONS TO MIXED NUMBERS  
CHANGE MIXED NUMBERS TO IMPROPER FRACTIONS  
REDUCE FRACTIONS TO LOWEST TERMS  
FIND EQUIVALENT FRACTIONS  
FIND LEAST COMMON DENOMINATORS  
ADD, SUBTRACT, MULTIPLY, AND DIVIDE FRACTIONS

GIVE DEFINITION OF A DECIMAL FRACTION  
NAME DECIMAL FRACTIONS  
CHANGE DECIMALS TO COMMON FRACTIONS  
CHANGE COMMON FRACTIONS TO DECIMALS  
ADD, SUBTRACT, MULTIPLY, AND DIVIDE DECIMALS

GIVE DEFINITION OF PERCENT  
INTERCHANGE DECIMAL, COMMON FRACTION, AND  
PERCENT  
WORK PERCENT PROBLEMS

GIVE DEFINITION OF RATIO AND PROPORTION  
SOLVE PROPORTION PROBLEMS

## ROMAN NUMERALS

Doctors frequently use the apothecaries' system when ordering medication. It is an old English system of measure with whole numbers expressed as Roman Numerals. It is important for a Practical Nurse to be able to read, understand, and work with this system. When expressing dosages, it is customary to use the lower case Roman Numerals.

ARABIC SYMBOLS	ROMAN SYMBOLS	LOWER CASE
1	I	i
2	II	ii
3	III	iii
4	IV	iv
5	V	v
6	VI	vi
7	VII	vii
8	VIII	viii
9	IX	ix
10	X	x
20	XX	xx
30	XXX	xxx
40	XL	xl
50	L	l
100	C	c
500	D	d
1000	M	m

Any number can be represented in Roman Numerals by repeating and combining these seven basic symbols. In order to learn to go from one system to the other, the following rules must be learned:

**ADDITION RULE** – When a Roman symbol for a smaller number follows the Roman symbol for a larger number, the quantities represented are added together.

Example: VI = 5 + 1 or 6                  VI = 6

To Work: XV = \_\_\_\_ + \_\_\_\_ = \_\_\_\_

XVII = \_\_\_\_ + \_\_\_\_ + \_\_\_\_ + \_\_\_\_ = \_\_\_\_

CL = \_\_\_\_ + \_\_\_\_ = \_\_\_\_

CLV = \_\_\_\_ + \_\_\_\_ + \_\_\_\_ = \_\_\_\_

**REPETITION RULE** -- In writing a numeral, the symbols I, X, C, and M may be repeated but not used more than three times together. The symbols V, L, and D are not repeated.

WHY DO YOU THINK V, D, AND L ARE NOT REPEATED?

Example:  $III = \underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{3}$

$XX = \underline{\quad} + \underline{\quad} = \underline{\quad}$

$MMM = \underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad}$

**SUBTRACTION RULE** -- When a Roman Numeral for a smaller number is placed in front or before a Roman Numeral for a larger number, the resulting number is the smaller subtracted from the larger.

Example: IX means X - I or 10 - 1 so IX = 9

XL means  $\underline{\quad} - \underline{\quad} = \underline{\quad}$

CM means  $\underline{\quad} - \underline{\quad} = \underline{\quad}$

The only symbols that can be put at the left of a larger number are I, X, and C.

ONLY I CAN BE PLACED BEFORE V OR X.  
ONLY X CAN BE PLACED BEFORE L OR C.  
ONLY C CAN BE PLACED BEFORE D OR M.

**GROUPING RULE** -- When the symbol for a smaller number is placed between two symbols for larger numbers, it is always grouped with the symbol on its right.

To determine the value of the entire numeral, use the subtraction rule first and then the addition rule.

Example: XIV is X and IV or  $10 + (5-1) = 14$

CXL is C plus XL or  $100 + (50-10) = 140$

CDXLV = CD + XL + V or  $\underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad}$

**MULTIPLICATION RULE** -- When a bar or line is placed over a symbol or group of symbols, the number represented under the bar is multiplied by 1000.

$\overline{V}$  means  $5 \times 1000 = 5000$

$\overline{XI}$  means  $11 \times 1000 = 11000$

$\overline{CCLI}$  means  $200 \times 1000 + 51$  or 200,051

The symbol for  $\frac{1}{2}$  is ss.

**Write the Arabic Numeral that the Roman Numeral represents:**

XXVII	_____	$\overline{VII}$	_____
XI	_____	LXVII	_____
XXXV	_____	XCIX	_____
XLVIII	_____	CXIV	_____
LXXIII	_____	CC	_____

**Write the Roman Numeral for each number below:**

88	_____	104	_____
59	_____	76	_____
63	_____	19	_____
560	_____	94	_____
38	_____	154	_____

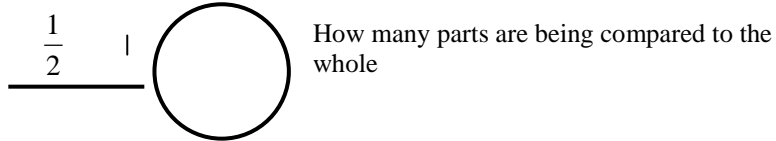
**Use Roman Numerals to represent the answers:**

$L + L =$	_____	$V + C =$	_____
$XXVIII + XI =$	_____	$XLII + VIII =$	_____
$CXL - LXX =$	_____	$XXVII - XVI =$	_____
$X \times X =$	_____	$VI \times IX =$	_____
$C \div X =$	_____	$XL \div IV =$	_____

# COMMON FRACTIONS

A fraction is a comparison between a part of the whole and the whole.

This whole circle is made up of 2 parts. The shaded area represents one of the parts.

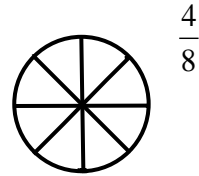
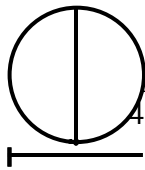
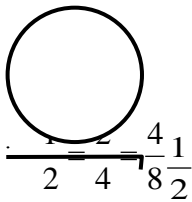


Part  
Whole

The number on the top is called the **NUMERATOR**.

The number on the bottom is called the **DENOMINATOR**.

**EQUIVALENT FRACTIONS** are two or more fractions which represent the same quantity.



amount of the area of the circle.

All of these fractions represent exactly the same

**Work the following problems:**

$$\frac{1}{2} = \frac{\quad}{8}$$

$$\frac{1}{3} = \frac{\quad}{12}$$

$$\frac{1}{4} = \frac{\quad}{32}$$

$$\frac{1}{6} = \frac{\quad}{72}$$

$$\frac{1}{5} = \frac{\quad}{20}$$

$$\frac{1}{7} = \frac{\quad}{28}$$

$$\frac{1}{3} = \frac{\quad}{45}$$

$$\frac{1}{4} = \frac{\quad}{48}$$

**Work the following problems:**

**Change to 12ths:**

$$\frac{1}{2} = \frac{\quad}{12}$$

$$\frac{2}{3} = \frac{\quad}{12}$$

$$\frac{3}{4} = \frac{\quad}{12}$$

$$\frac{5}{6} = \frac{\quad}{12}$$

**Change to 32nds:**

$$\frac{3}{4} = \frac{\quad}{32}$$

$$\frac{5}{8} = \frac{\quad}{32}$$

$$\frac{7}{8} = \frac{\quad}{32}$$

$$\frac{9}{16} = \frac{\quad}{32}$$

**Change to 72nds:**

$$\frac{2}{3} = \frac{\quad}{72}$$

$$\frac{3}{4} = \frac{\quad}{72}$$

$$\frac{5}{6} = \frac{\quad}{72}$$

$$\frac{7}{8} = \frac{\quad}{72}$$

**Change to 4ths:**

$$\frac{12}{16} = \frac{\quad}{4}$$

$$\frac{18}{24} = \frac{\quad}{4}$$

$$\frac{24}{32} = \frac{\quad}{4}$$

$$\frac{42}{56} = \frac{\quad}{4}$$

**Change to 9ths:**

$$\frac{15}{27} = \frac{\quad}{9}$$

$$\frac{45}{81} = \frac{\quad}{9}$$

$$\frac{20}{36} = \frac{\quad}{9}$$

$$\frac{42}{54} = \frac{\quad}{9}$$

**Change to 16ths:**

$$\frac{15}{48} = \frac{\quad}{16}$$

$$\frac{25}{80} = \frac{\quad}{16}$$

$$\frac{28}{64} = \frac{\quad}{16}$$

$$\frac{18}{32} = \frac{\quad}{16}$$

## REDUCING FRACTIONS TO LOWEST TERMS

A fraction is in its lowest terms when there are no whole numbers that will divide into both the numerator and denominator.

For example:

$$\frac{12}{18} \quad \text{Six will go into both the numerator and the denominator to produce} \quad \frac{2}{3}$$

There is not a number that will go into both 2 and 3 so this fraction is in its lowest term.  $\frac{2}{3}$

**Reduce the following fractions:**

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

$$\frac{4}{10} =$$

$$\frac{3}{9} =$$

$$\frac{6}{12} =$$

$$\frac{5}{20} =$$

$$\frac{2}{14} =$$

$$\frac{15}{15} =$$

$$\frac{4}{16} =$$

$$\frac{25}{50} =$$

$$\frac{45}{60} =$$

$$\frac{35}{50} =$$

$$\frac{20}{60} =$$

$$\frac{6}{20} =$$

$$\frac{18}{24} =$$

$$\frac{8}{12} =$$

$$\frac{8}{20} =$$

**Reduce the following to lowest terms:**

$$\frac{12}{16} =$$

$$\frac{24}{64} =$$

$$\frac{18}{32} =$$

$$\frac{9}{24} =$$

$$\frac{18}{30} =$$

$$\frac{15}{72} =$$

$$\frac{24}{84} =$$

$$\frac{15}{60} =$$

$$\frac{28}{96} =$$

$$\frac{57}{95} =$$

$$\frac{51}{85} =$$

$$\frac{15}{36} =$$

$$\frac{36}{66} =$$

$$\frac{18}{54} =$$

$$\frac{48}{72} =$$

$$\frac{24}{40} =$$

$$\frac{63}{81} =$$

$$\frac{27}{108} =$$

## **IMPROPER FRACTIONS AND MIXED NUMBERS**

A mixed number has a whole number and a fraction. Examples are:

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

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

$$15\frac{1}{3}$$

You might visualize them in this way:

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



You can see that the whole blocks are divided into halves.

You may express  $2\frac{1}{2}$  as

the number of halves in the group. There are five halves in the group.

$\frac{5}{2}$  and  $2\frac{1}{2}$  represent the same quantity.

$\frac{5}{2}$  is called an improper fraction. In calculations you need to know how to go from a mixed number to an improper fraction and from an improper fraction to a mixed number.

### **IMPROPER FRACTION -- The NUMERATOR is greater than the DENOMINATOR**

To go from an improper fraction to a mixed number:

$\frac{5}{2}$  1. Divide the denominator into the numerator to get the greatest whole number.

5 divided by 2 = 2 with 1 remainder

2. Put the remainder over the denominator.

$$\frac{5}{2} = 2\frac{1}{2}$$

**Express each improper fraction as a mixed number:**

$$\frac{5}{3} =$$

$$\frac{11}{7} =$$

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

$$\frac{19}{10} =$$

$$\frac{48}{8} =$$

$$\frac{9}{4} =$$

$$\frac{16}{5} =$$

$$\frac{121}{100} =$$

$$\frac{11}{2} =$$

$$\frac{13}{3} =$$

$$\frac{90}{60} =$$

$$\frac{17}{5} =$$

$$\frac{6}{3} =$$

$$\frac{28}{10} =$$

$$\frac{3250}{1000} =$$

$$\frac{35}{8} =$$

$$\frac{47}{32} =$$

$$\frac{53}{6} =$$

$$\frac{55}{12} =$$

$$\frac{42}{32} =$$

$$\frac{121}{64} =$$

$$\frac{144}{17} =$$

$$\frac{53}{16} =$$

$$\frac{72}{15} =$$

To go from a mixed number to an improper fraction

- $2\frac{1}{2}$
1. Multiply the whole number by the denominator of the fraction  $2 \times 2$
  2. Add the numerator  $(2 \times 2) + 1 = 5$  This (5) becomes the numerator of the improper fraction.

$$2\frac{1}{2} = \frac{5}{2}$$

$$\frac{5}{2} = 2\frac{1}{2}$$

**Express each mixed number as an improper fraction:**

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

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

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

$$11\frac{1}{8} =$$

$$21\frac{9}{10} =$$

$$5\frac{1}{10} =$$

$$9\frac{1}{11} =$$

$$10\frac{3}{32} =$$

$$8\frac{1}{2} =$$

$$30\frac{1}{4} =$$

$$50\frac{1}{4} =$$

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

$$33\frac{1}{3} =$$

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

$$6\frac{7}{8} =$$

$$9\frac{11}{12} =$$

$$8\frac{9}{16} =$$

$$3\frac{9}{10} =$$



In some problems the fractions do not have the same denominator. They cannot be added or subtracted until a common denominator is found. You will want to find the **LOWEST COMMON DENOMINATOR. (LCD)**

The LCD is the smallest number that all the denominators can be divided into evenly.

Example: 
$$\frac{1}{4} + \frac{5}{6}$$

Multiples

4, 8, (12), 16, 20, (24)

6, (12), 18, (24), 30, 36

You can see that 12 and 24 are both common multiples of 4 and 6. You want the least common multiple. So 12 is the least common denominator.

$$\begin{array}{r} \frac{1}{4} = \frac{3}{12} \\ + \frac{5}{6} = \frac{10}{12} \\ \hline \frac{13}{12} = 1\frac{1}{12} \end{array}$$

Now make equivalent fractions.

$$\frac{1}{4} = \frac{3}{12} \quad \text{and} \quad \frac{5}{6} = \frac{10}{12}$$

Add numerators – Use LCD – Make into mixed number

Another way to find the LCD is by PRIME FACTORIZATION. This is used when there are several fractions with different denominators.

Example:  $\frac{1}{8} + \frac{3}{16} + \frac{7}{20} + \frac{1}{25}$

1. Arrange all denominators in a horizontal row
2. Divide any prime number which will go into 25  
At least two of the numbers. Put the quotient under the number.
3. Bring down any number that the divisor will 25  
not go into evenly.
4. Continue until there are all ones (1) across the bottom.
5. Multiply all the divisors together to get the LCD.
6. The Lowest Common Denominator is 400.

	8	16	20	25
2	4	8	10	
2	2	4	5	25
2	1	2	5	25
2	1	1	5	
5	1	1	1	5
5	1	1	1	1

$$5 \times 5 \times 2 \times 2 \times 2 \times 2 = 400$$

**Find the Lowest Common Denominators for the following:**

1).  $\frac{1}{8}, \frac{1}{12}, \frac{2}{15}, \frac{3}{20}$  \_\_\_\_\_

2).  $\frac{1}{16}, \frac{1}{20}, \frac{1}{24}, \frac{1}{40}$  \_\_\_\_\_

3).  $\frac{5}{6}, \frac{7}{8}, \frac{5}{9}, \frac{7}{12}$  \_\_\_\_\_

4).  $\frac{1}{15}, \frac{9}{16}, \frac{13}{20}, \frac{11}{32}$  \_\_\_\_\_

5).  $\frac{9}{16}, \frac{7}{12}, \frac{5}{8}, \frac{11}{32}$  \_\_\_\_\_

6).  $\frac{5}{12}, \frac{15}{32}, \frac{11}{48}, \frac{19}{64}$  \_\_\_\_\_

**Add or Subtract the following:**

$$\begin{array}{r} \frac{1}{2} \\ + \frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{1}{10} \\ + \frac{3}{20} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{2}{8} \\ + \frac{3}{16} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{3}{4} \\ + \frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{8}{5} \\ - \frac{1}{10} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{4}{3} \\ + \frac{5}{6} \\ \hline \end{array}$$

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

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

$$\frac{4}{5}$$

$$\frac{-10}{6}$$

---

$$\frac{+10}{8}$$

---

$$\frac{-1}{20}$$

---

$$\frac{3}{8}$$
$$\frac{-1}{4}$$

---

$$\frac{1}{2}$$
$$\frac{-3}{7}$$

---

$$\frac{18}{8}$$
$$\frac{-6}{4}$$

---

$$\frac{2}{5}$$
$$\frac{-3}{10}$$

---

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

---

$$\frac{4}{5}$$
$$\frac{+3}{4}$$

---

$$\frac{5}{6}$$
$$\frac{+4}{9}$$

---

$$\frac{5}{9}$$
$$\frac{+4}{7}$$

---

$$\frac{15}{16}$$
$$\frac{+5}{6}$$

---

$$\frac{2}{3}$$
$$\frac{3}{5}$$
$$\frac{2}{9}$$
$$\frac{+1}{15}$$

---

$$\frac{1}{12}$$
$$\frac{5}{8}$$
$$\frac{5}{6}$$
$$\frac{+2}{3}$$

---

$$\frac{15}{32}$$
$$\frac{3}{8}$$
$$\frac{7}{16}$$
$$\frac{+7}{24}$$

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## ADDITION AND SUBTRACTION OF MIXED NUMBERS

Addition of mixed numbers is exactly the same as addition of fractions except that the whole number must also be added.

$$\begin{array}{r} 2\frac{1}{4} = 2\frac{3}{12} \\ +3\frac{5}{6} = 3\frac{10}{12} \\ \hline 5\frac{13}{12} = 6\frac{1}{12} \end{array}$$

**Work the following:**

$$\begin{array}{r} 4\frac{3}{4} \\ +7\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{2}{3} \\ +9\frac{5}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 8\frac{1}{6} \\ +5\frac{7}{12} \\ \hline \end{array}$$

$$\begin{array}{r} 3\frac{1}{2} \\ +2\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{2} \\ +12\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 7\frac{1}{2} \\ +8\frac{1}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{1}{8} \\ 8\frac{3}{4} \\ +12\frac{5}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 3\frac{1}{3} \\ 1\frac{5}{8} \\ +4\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 3\frac{2}{3} \\ 4\frac{1}{9} \\ +5\frac{1}{8} \\ \hline \end{array}$$

$$14\frac{3}{8}$$

$$75\frac{2}{5}$$

$$7\frac{1}{2}$$

$$\begin{array}{r} +17\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} +14\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} -1\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{2}{3} \\ -3\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 10\frac{7}{8} \\ -6\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 4\frac{7}{8} \\ -2\frac{3}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{7}{8} \\ -4\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{4}{5} \\ -8\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 5\frac{3}{4} \\ -1\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 7\frac{7}{18} \\ +8\frac{7}{9} \\ \hline \end{array}$$

$$\begin{array}{r} 16\frac{9}{16} \\ +32\frac{15}{32} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{11}{16} \\ -7\frac{1}{4} \\ \hline \end{array}$$

In some subtraction problems, it is necessary to borrow before subtracting numerators.

$$\begin{array}{r} \text{Example: } 6\frac{1}{2} = 6\frac{2}{4} = 5 + \frac{2}{4} + \frac{4}{4} = 5\frac{6}{4} \\ -3\frac{3}{4} = 3\frac{3}{4} \qquad \qquad \qquad -3\frac{3}{4} \\ \hline \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad 2\frac{3}{4} \end{array}$$

After finding the common denominator, you can see that you cannot subtract the numerators as they are. If a whole number (1) is borrowed from the 6 and added back as a fraction, then the numerators can be subtracted.

**Work these problems:**

$$\begin{array}{r} 7\frac{1}{4} \\ -1\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{6} \\ -3\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 10\frac{3}{4} \\ -6\frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 4\frac{3}{5} \\ -1\frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 6\frac{1}{6} \\ -4\frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 5\frac{1}{6} \\ -2\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{2}{3} \\ -8\frac{4}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 7\frac{1}{4} \\ -6\frac{2}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 3\frac{1}{3} \\ -2\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 9\frac{2}{3} \\ -4\frac{4}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 12\frac{3}{4} \\ -5\frac{5}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 12\frac{1}{4} \\ -8\frac{1}{3} \\ \hline \end{array}$$

**For more practice:**

$$\begin{array}{r} 3\frac{1}{3} \\ +5\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 2\frac{3}{4} \\ +4\frac{8}{16} \\ \hline \end{array}$$

$$\begin{array}{r} 8\frac{1}{12} \\ +3\frac{5}{36} \\ \hline \end{array}$$

$$\begin{array}{r} 5\frac{1}{2} \\ +9\frac{7}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 4\frac{4}{5} \\ +13\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 16\frac{4}{5} \\ -9\frac{3}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 37\frac{2}{3} \\ -14\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 11\frac{4}{32} \\ -2\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 53 \\ -12\frac{3}{25} \\ \hline \end{array}$$

$$\begin{array}{r} 18\frac{1}{2} \\ -9\frac{7}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 14\frac{7}{15} \\ -3\frac{11}{12} \\ \hline \end{array}$$

$$\begin{array}{r} 1\frac{2}{5} \\ -\frac{7}{10} \\ \hline \end{array}$$

$$\begin{array}{r} 2\frac{5}{6} \\ 3\frac{1}{5} \\ +2\frac{4}{15} \\ \hline \end{array}$$

$$\begin{array}{r} 7\frac{3}{8} \\ -\frac{5}{7} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{12} \\ \frac{2}{9} \\ +7 \\ \hline \end{array}$$

## MULTIPLICATION OF FRACTIONS

The rule for multiplying fractions is to **multiply numerators together and multiply denominators together.**

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12} = \frac{1}{2} \quad \text{Remember - always reduce to lowest terms}$$

To simplify the problem you may want to reduce the terms of the problem before multiplying. This is called **cancellation.**

Example:  $\frac{3}{4} \times \frac{2}{9}$       The 3 divides into the 9. The 2 divides into the 4.

Example:  $\frac{3}{4} \times \frac{1}{2} \times \frac{6}{9} \times \frac{12}{18} =$

In this example you can see that many of the numbers will cancel.  
Remember - you must always cancel from top to bottom or bottom to top.

**Work these problems:**

$$\frac{3}{8} \times \frac{3}{5} = \underline{\hspace{2cm}}$$

$$\frac{5}{9} \times \frac{7}{12} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \times \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{5}{16} \times \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} \times \frac{16}{25} = \underline{\hspace{2cm}}$$

$$\frac{2}{9} \times \frac{7}{11} = \underline{\hspace{2cm}}$$

$$\frac{5}{16} \times \frac{3}{4} = \underline{\hspace{2cm}}$$

$$\frac{9}{10} \times \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{11}{12} \times \frac{5}{16} = \underline{\hspace{2cm}}$$

$$\frac{19}{24} \times \frac{6}{5} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \times \frac{3}{16} = \underline{\hspace{2cm}}$$

$$\frac{7}{12} \times \frac{8}{12} = \underline{\hspace{2cm}}$$

$$\frac{7}{8} \times \frac{6}{7} = \underline{\hspace{2cm}}$$

$$\frac{5}{9} \times \frac{9}{10} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \times \frac{5}{8} = \underline{\hspace{2cm}}$$

**For more practice:**

$$\frac{15}{16} \times \frac{32}{45} = \underline{\hspace{2cm}}$$

$$\frac{7}{16} \times \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{5}{16} \times \frac{4}{15} = \underline{\hspace{2cm}}$$

$$\frac{3}{8} \times \frac{4}{5} \times \frac{5}{9} \times \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{9}{10} \times \frac{5}{12} \times \frac{16}{21} \times \frac{3}{4} = \underline{\hspace{2cm}}$$

$$\frac{3}{16} \times \frac{4}{5} \times \frac{2}{3} \times \frac{1}{4} = \underline{\hspace{2cm}}$$

$$\frac{7}{8} \times \frac{2}{3} \times \frac{1}{2} \times \frac{5}{7} = \underline{\hspace{2cm}}$$

$$\frac{5}{12} \times \frac{7}{16} \times \frac{8}{15} \times \frac{16}{21} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \times \frac{5}{7} \times \frac{7}{8} \times \frac{1}{2} = \underline{\hspace{2cm}}$$

$$\frac{13}{15} \times \frac{5}{12} \times \frac{8}{9} \times \frac{3}{4} = \underline{\hspace{2cm}}$$

$$\frac{7}{9} \times \frac{5}{12} \times \frac{3}{14} \times \frac{3}{5} = \underline{\hspace{2cm}}$$

$$\frac{7}{10} \times 16 = \underline{\hspace{2cm}}$$

$$\frac{3}{4} \times \frac{2}{9} = \underline{\hspace{2cm}}$$

$$\frac{1}{3} \text{ of } \frac{1}{2} = \underline{\hspace{2cm}}$$

$$\frac{1}{2} \text{ of } \frac{3}{5} = \underline{\hspace{2cm}}$$

$$\frac{1}{4} \text{ of } \frac{3}{7} = \underline{\hspace{2cm}}$$

$$\frac{1}{5} \text{ of } \frac{2}{3} = \underline{\hspace{2cm}}$$

**“of” means “times”**

## MULTIPLICATION OF MIXED NUMBERS

When mixed numbers are multiplied, the mixed number must first be expressed as an improper fraction.

Example:  $3 \times 1\frac{1}{4} =$

1. Express 3 as  $\frac{3}{1}$
2. Change  $1\frac{1}{4}$  to improper fraction  $1\frac{1}{4} = \frac{5}{4}$
3. Multiply  $\frac{3}{1} \times \frac{5}{4} = \frac{15}{4}$
4. Change back to mixed number.  $\frac{15}{4} = 3\frac{3}{4}$

Example:  $2\frac{1}{2} \times 3\frac{3}{4} =$

1. Change  $2\frac{1}{2}$  to improper fraction  $2\frac{1}{2} = \frac{5}{2}$
2. Change  $3\frac{3}{4}$  to improper fraction  $3\frac{3}{4} = \frac{15}{4}$
3. Multiply  $\frac{5}{2} \times \frac{15}{4} = \frac{75}{8}$
4. Change back to mixed number.  $\frac{75}{8} = 9\frac{3}{8}$

**Work the following:**

$$4\frac{2}{3} \times 6\frac{1}{2} = \underline{\hspace{2cm}}$$

$$9\frac{3}{4} \times 10\frac{1}{3} = \underline{\hspace{2cm}}$$

$$5\frac{3}{8} \times 7\frac{2}{5} = \underline{\hspace{2cm}}$$

$$8\frac{5}{6} \times 3\frac{2}{7} = \underline{\hspace{2cm}}$$

$$11\frac{5}{9} \times 6\frac{1}{12} = \underline{\hspace{2cm}}$$

$$12\frac{4}{7} \times 9\frac{7}{11} = \underline{\hspace{2cm}}$$

$$\frac{1}{5} \text{ of } 245 = \underline{\hspace{2cm}}$$

$$810 \times \frac{2}{3} = \underline{\hspace{2cm}}$$

$$8\frac{5}{9} \times 4\frac{1}{11} = \underline{\hspace{2cm}}$$

**More practice:**

$$1\frac{1}{3} \times \frac{2}{5} = \underline{\hspace{2cm}}$$

$$3\frac{1}{4} \times \frac{1}{6} = \underline{\hspace{2cm}}$$

$$4\frac{2}{8} \times \frac{2}{3} = \underline{\hspace{2cm}}$$

$$4\frac{1}{2} \times \frac{1}{4} = \underline{\hspace{2cm}}$$

$$1\frac{1}{3} \times 2\frac{3}{4} = \underline{\hspace{2cm}}$$

$$3\frac{1}{2} \times 4\frac{2}{3} = \underline{\hspace{2cm}}$$

$$4\frac{1}{3} \times 5\frac{1}{2} = \underline{\hspace{2cm}}$$

$$3\frac{1}{2} \times 4\frac{3}{8} = \underline{\hspace{2cm}}$$

$$3\frac{1}{5} \times 5\frac{1}{3} = \underline{\hspace{2cm}}$$

$$3\frac{1}{5} \times 2\frac{3}{4} = \underline{\hspace{2cm}}$$

$$1\frac{5}{6} \times 2\frac{1}{4} = \underline{\hspace{2cm}}$$

$$2\frac{7}{8} \times 2\frac{1}{4} = \underline{\hspace{2cm}}$$

$$3\frac{1}{3} \times 10 = \underline{\hspace{2cm}}$$

$$2\frac{5}{6} \times 4\frac{1}{3} = \underline{\hspace{2cm}}$$

$$1\frac{1}{10} \times 3\frac{2}{5} = \underline{\hspace{2cm}}$$

$$4\frac{1}{4} \times \frac{7}{17} = \underline{\hspace{2cm}}$$

$$2\frac{4}{10} \times \frac{20}{6} = \underline{\hspace{2cm}}$$

$$20\frac{5}{8} \times 2\frac{4}{5} = \underline{\hspace{2cm}}$$

## DIVISION OF FRACTIONS

To divide one fraction by another, you must invert (turn upside down) the divisor (the second fraction) and then multiply.

Example:  $\frac{2}{3} \div \frac{1}{2} =$

1. Write first fraction  $\frac{2}{3}$

2. Change  $\div$  sign to "x"

3. Invert divisor  $\frac{2}{1}$

4. Now multiply and simplify  $\frac{2}{3} \times \frac{2}{1} = \frac{4}{3} = 1\frac{1}{3}$

**Work the following:**

$$\frac{5}{8} \div \frac{2}{7} = \underline{\hspace{2cm}}$$

$$\frac{5}{12} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{7}{15} \div \frac{4}{9} = \underline{\hspace{2cm}}$$

$$\frac{3}{16} \div \frac{1}{8} = \underline{\hspace{2cm}}$$

$$\frac{5}{9} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{9}{16} \div \frac{7}{12} = \underline{\hspace{2cm}}$$

$$\frac{11}{12} \div \frac{14}{15} = \underline{\hspace{2cm}}$$

$$\frac{17}{18} \div \frac{8}{9} = \underline{\hspace{2cm}}$$

$$\frac{19}{32} \div \frac{17}{24} = \underline{\hspace{2cm}}$$

$$\frac{22}{27} \div \frac{28}{33} = \underline{\hspace{2cm}}$$

$$\frac{25}{42} \div \frac{5}{21} = \underline{\hspace{2cm}}$$

$$\frac{35}{72} \div \frac{21}{32} = \underline{\hspace{2cm}}$$

### More practice:

$$\frac{7}{8} \div \frac{5}{9} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \div \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{3}{8} \div \frac{1}{3} = \underline{\hspace{2cm}}$$

$$\frac{7}{12} \div \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{1}{8} \div \frac{3}{16} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \div \frac{1}{2} = \underline{\hspace{2cm}}$$

$$\frac{3}{5} \div \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{7}{8} \div \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{3}{16} \div \frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{5}{6} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} \div \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{6}{7} \div \frac{1}{3} = \underline{\hspace{2cm}}$$

$$\frac{5}{9} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{3}{8} \div \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{1}{3} \div \frac{3}{8} = \underline{\hspace{2cm}}$$

$$\frac{4}{5} \div \frac{7}{12} = \underline{\hspace{2cm}}$$

$$\frac{3}{16} \div \frac{1}{8} = \underline{\hspace{2cm}}$$

$$\frac{1}{2} \div \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} \div \frac{4}{5} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

$$\frac{2}{3} \div \frac{3}{16} = \underline{\hspace{2cm}}$$

$$\frac{7}{8} \div \frac{5}{6} = \underline{\hspace{2cm}}$$

$$\frac{1}{3} \div \frac{6}{7} = \underline{\hspace{2cm}}$$

$$\frac{5}{12} \div \frac{7}{8} = \underline{\hspace{2cm}}$$

## DIVISION OF MIXED NUMBERS

To divide mixed numbers, change all the mixed numbers to improper fractions and then divide as with other fractions.

Example:  $2\frac{1}{2} \div 3\frac{1}{4} =$

1. Change both to improper fractions  $2\frac{1}{2} = \frac{5}{2}$
2. Write the first number as is --  $\frac{5}{2}$
3. Change division sign to multiplication sign
4. Invert divisor  $\frac{4}{13}$
5. Now multiply and simplify  $\frac{5}{2} \times \frac{4}{13} = \frac{20}{26} = \frac{10}{13}$

**Work the following:**

$$1\frac{1}{2} \div 2\frac{1}{4} = \underline{\hspace{2cm}}$$

$$2\frac{3}{4} \div 1\frac{2}{3} = \underline{\hspace{2cm}}$$

$$3\frac{1}{3} \div 4\frac{2}{9} = \underline{\hspace{2cm}}$$

$$16\frac{2}{3} \div 3\frac{1}{3} = \underline{\hspace{2cm}}$$

$$15 \div 2\frac{1}{2} = \underline{\hspace{2cm}}$$

$$6\frac{3}{5} \div 2\frac{1}{2} = \underline{\hspace{2cm}}$$

$$100 \div 3\frac{1}{3} = \underline{\hspace{2cm}}$$

$$4\frac{1}{3} \div 3 = \underline{\hspace{2cm}}$$

$$4\frac{7}{8} \div 2\frac{1}{6} = \underline{\hspace{2cm}}$$

**More practice:**

$$4\frac{3}{8} \div 2\frac{5}{6} = \underline{\hspace{2cm}}$$

$$1 \div 8\frac{1}{3} = \underline{\hspace{2cm}}$$

$$2\frac{2}{3} \div 1\frac{1}{2} = \underline{\hspace{2cm}}$$

$$1 \div 16\frac{2}{3} = \underline{\hspace{2cm}}$$

$$\frac{1}{28} \div 7\frac{1}{2} = \underline{\hspace{2cm}}$$

$$5\frac{1}{2} \div 3\frac{1}{3} = \underline{\hspace{2cm}}$$

$$6\frac{3}{4} \div 5\frac{1}{2} = \underline{\hspace{2cm}}$$

$$3\frac{3}{5} \div 5\frac{1}{4} = \underline{\hspace{2cm}}$$

$$7\frac{2}{3} \div 2\frac{3}{4} = \underline{\hspace{2cm}}$$

$$8\frac{5}{6} \div 6\frac{2}{3} = \underline{\hspace{2cm}}$$

$$2\frac{3}{8} \div 4\frac{1}{6} = \underline{\hspace{2cm}}$$

$$\frac{5}{8} \div 7\frac{1}{8} = \underline{\hspace{2cm}}$$

$$2\frac{3}{8} \div 1\frac{3}{4} = \underline{\hspace{2cm}}$$

$$7\frac{1}{2} \div 5\frac{2}{3} = \underline{\hspace{2cm}}$$

$$9\frac{3}{5} \div 6\frac{1}{4} = \underline{\hspace{2cm}}$$

## DECIMAL FRACTIONS

A decimal fraction is a way of expressing a common fraction whose denominator is a power of ten.

Example:  $\frac{1}{5} = \frac{2}{10} = \frac{20}{100} = \frac{200}{1000} = \frac{2000}{10000}$  etc.

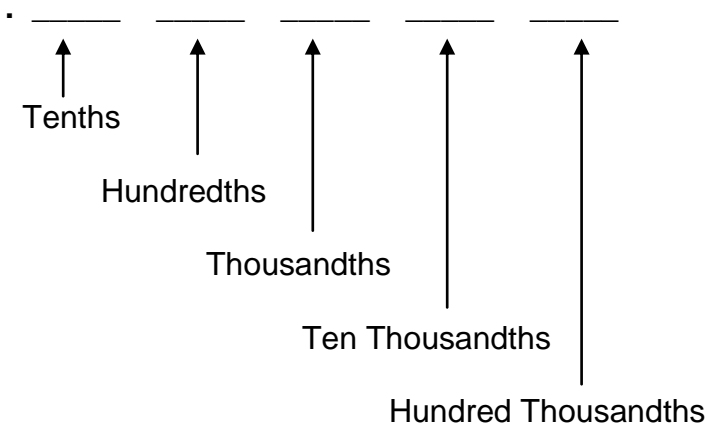
These are all equivalent fractions with denominators that are powers of ten.

$$\frac{5}{10} = .5 \quad \text{This is read five tenths}$$

$$\frac{50}{100} = .50 \quad \text{This is read fifty hundredths}$$

$$\frac{500}{1000} = .500 \quad \text{This is read five hundred thousandths}$$

Any decimal fraction can be expressed as a common fraction that has a denominator that is a power of ten.



**Express these quantities as decimal fractions:**

$$\frac{3}{10} = \underline{\hspace{2cm}}$$

$$\frac{9}{1000} = \underline{\hspace{2cm}}$$

$$\frac{7}{10,000} = \underline{\hspace{2cm}}$$

$$\frac{21}{100} = \underline{\hspace{2cm}}$$

$$\frac{7}{10} = \underline{\hspace{2cm}}$$

$$\frac{80}{1000} = \underline{\hspace{2cm}}$$

**Express these quantities as decimal fractions:**

$$\frac{137}{1,000} = \underline{\hspace{2cm}}$$

$$\frac{31}{10,000} = \underline{\hspace{2cm}}$$

$$\frac{132}{100} = \underline{\hspace{2cm}}$$

$$4 + \frac{2}{10} = \underline{\hspace{2cm}}$$

$$7 + \frac{8}{100} = \underline{\hspace{2cm}}$$

$$11 + \frac{17}{1,000} = \underline{\hspace{2cm}}$$

$$5 \frac{9}{10} = \underline{\hspace{2cm}}$$

$$4 \frac{7}{1,000} = \underline{\hspace{2cm}}$$

$$2 \frac{1}{10,000} = \underline{\hspace{2cm}}$$

three and sixty four thousandths  $\underline{\hspace{2cm}}$

nine tenths  $\underline{\hspace{2cm}}$

twenty five point eight  $\underline{\hspace{2cm}}$

**Express these decimals in words:**

.9  $\underline{\hspace{2cm}}$

100.01  $\underline{\hspace{2cm}}$

.04  $\underline{\hspace{2cm}}$

12.7  $\underline{\hspace{2cm}}$

21.2  $\underline{\hspace{2cm}}$

.020  $\underline{\hspace{2cm}}$

.0003  $\underline{\hspace{2cm}}$

10.1  $\underline{\hspace{2cm}}$

**Express these decimals as common fractions in lowest terms:**

$$.25 = \underline{\hspace{1cm}} \quad .005 = \underline{\hspace{1cm}} \quad .125 = \underline{\hspace{1cm}} \quad .005 = \underline{\hspace{1cm}}$$

$$.025 = \underline{\hspace{1cm}} \quad .0005 = \underline{\hspace{1cm}} \quad .625 = \underline{\hspace{1cm}} \quad .3125 = \underline{\hspace{1cm}}$$

$$.0375 = \underline{\hspace{1cm}} \quad .17 = \underline{\hspace{1cm}} \quad .03 = \underline{\hspace{1cm}} \quad .41 = \underline{\hspace{1cm}}$$

$$5.19 = \underline{\hspace{1cm}} \quad 6.47 = \underline{\hspace{1cm}} \quad 5.01 = \underline{\hspace{1cm}} \quad 21.08 = \underline{\hspace{1cm}}$$

$$23.98 = \underline{\hspace{1cm}} \quad 44.88 = \underline{\hspace{1cm}} \quad .0125 = \underline{\hspace{1cm}} \quad .0025 = \underline{\hspace{1cm}}$$

## CHANGING COMMON FRACTIONS TO DECIMAL FRACTIONS

To change a common fraction into a decimal fraction **divide the denominator into the numerator.**

Example:  $\frac{1}{4}$        $4 \overline{)1}$        $\frac{1}{4} = .25$

**Change the following:**

$\frac{1}{2} = \underline{\hspace{2cm}}$        $\frac{17}{20} = \underline{\hspace{2cm}}$        $\frac{5}{8} = \underline{\hspace{2cm}}$        $\frac{11}{5} = \underline{\hspace{2cm}}$

$\frac{3}{75} = \underline{\hspace{2cm}}$        $\frac{9}{10} = \underline{\hspace{2cm}}$        $\frac{23}{50} = \underline{\hspace{2cm}}$        $\frac{115}{250} = \underline{\hspace{2cm}}$

$\frac{13}{25} = \underline{\hspace{2cm}}$        $2\frac{3}{4} = \underline{\hspace{2cm}}$        $\frac{9}{40} = \underline{\hspace{2cm}}$        $\frac{11}{25} = \underline{\hspace{2cm}}$

$\frac{13}{8} = \underline{\hspace{2cm}}$        $\frac{7}{2} = \underline{\hspace{2cm}}$        $\frac{121}{100} = \underline{\hspace{2cm}}$        $\frac{7}{3} = \underline{\hspace{2cm}}$

$\frac{1}{6} = \underline{\hspace{2cm}}$        $\frac{1}{3} = \underline{\hspace{2cm}}$        $\frac{2}{3} = \underline{\hspace{2cm}}$        $\frac{1}{9} = \underline{\hspace{2cm}}$

Now you should be able to convert from decimal to common fraction and from common fraction to decimal fraction easily. Keep in mind that these are two ways of representing the same quantity.

**Complete this table:**

Decimal	Fraction	Decimal	Fraction
.0625			$\frac{5}{6}$
	$\frac{1}{12}$	.750	
	$\frac{2}{3}$	.375	
.875			$\frac{1}{8}$

## ADDITION AND SUBTRACTION OF DECIMALS

The rule to remember is **LINE UP THE DECIMAL POINTS.**

When the points have been lined up, then do the operation called for -- either add or subtract the numbers.

**Do these:**

$$3.6024 + 18.32 + 15.05 + 16.5 + 187.16 = \underline{\hspace{2cm}}$$

$$90 + .028 + 3.005 + 76 + .02 + 1.1682 = \underline{\hspace{2cm}}$$

$$38.1 - 4.56789 = \underline{\hspace{2cm}} \qquad 257 - 152.0672 = \underline{\hspace{2cm}}$$

$$.0947 - .00965 = \underline{\hspace{2cm}} \qquad 13.4786 - 2.75 = \underline{\hspace{2cm}}$$

$$4.92 - 3.8769 = \underline{\hspace{2cm}} \qquad 125 - 27.00912 = \underline{\hspace{2cm}}$$

$$.57 - .001027 = \underline{\hspace{2cm}} \qquad 13.025 - .9875 = \underline{\hspace{2cm}}$$

$$324.3025 + .02 + 34.786 + 1.00056 + .025 = \underline{\hspace{2cm}}$$

$$17.2 + 185 + .0384 + 6 + 8.478 + .025 = \underline{\hspace{2cm}}$$

$$.0274 + 3.8 + 165 + 24.5675 + .0027 = \underline{\hspace{2cm}}$$

$$6.2784 + .02 + 3.875 + 14.1 + 5.5 + 16.01 = \underline{\hspace{2cm}}$$

$$2.005 + .0375 + 14.1875 + 7.75 + .025 = \underline{\hspace{2cm}}$$

$$4.2 + 38 .04 + 1.163 = \underline{\hspace{2cm}}$$

## MULTIPLICATION OF DECIMALS

The word to remember with both multiplication and division of decimals is **COUNT**.

Example:

$$\begin{array}{r} 1.5 \\ \times .26 \\ \hline 90 \\ 30 \\ \hline .390 \end{array}$$

1. Multiply the numbers as if there is no decimal point
2. Start at the right end of each number in the top of the problem and count the places.
3. There are 3 decimal places in this problem, so there must be 3 decimal places in the answer.
4. Start at the right end of the answer and count over 3 places.
5. The answer is .390

**Do the following:**

$$\begin{array}{r} 2.5 \\ \times .37 \\ \hline \end{array}$$

$$\begin{array}{r} 42.1 \\ \times .38 \\ \hline \end{array}$$

$$\begin{array}{r} 316.4 \\ \times 2.6 \\ \hline \end{array}$$

$$\begin{array}{r} 2.16 \\ \times 24.2 \\ \hline \end{array}$$

$$\begin{array}{r} .0421 \\ \times 32.1 \\ \hline \end{array}$$

$$\begin{array}{r} 43 \\ \times .28 \\ \hline \end{array}$$

$$\begin{array}{r} 48.6 \\ \times 3.1 \\ \hline \end{array}$$

$$\begin{array}{r} .0382 \\ \times 41 \\ \hline \end{array}$$

$$\begin{array}{r} .318 \\ \times 4.12 \\ \hline \end{array}$$

$$\begin{array}{r} .0316 \\ \times 11.2 \\ \hline \end{array}$$

$$\begin{array}{r} .31 \\ \times .16 \\ \hline \end{array}$$

$$\begin{array}{r} 1.31 \\ \times .24 \\ \hline \end{array}$$

$$\begin{array}{r} 30.8 \\ \times .141 \\ \hline \end{array}$$

$$\begin{array}{r} 8.4 \\ \times 9.2 \\ \hline \end{array}$$

$$\begin{array}{r} .513 \\ \times 2.6 \\ \hline \end{array}$$

$$\begin{array}{r} 3.160 \\ \times 4.3 \\ \hline \end{array}$$

$$\begin{array}{r} .204 \\ \times 10.5 \\ \hline \end{array}$$

$$\begin{array}{r} .36 \\ \times 7.5 \\ \hline \end{array}$$

$$\begin{array}{r} 4.08 \\ \times 3.6 \\ \hline \end{array}$$

$$\begin{array}{r} 32.4 \\ \times .018 \\ \hline \end{array}$$

$$\begin{array}{r} .032 \\ \times 4.21 \\ \hline \end{array}$$

$$\begin{array}{r} 9.6 \\ \times .83 \\ \hline \end{array}$$

$$\begin{array}{r} 31.2 \\ \times 4.3 \\ \hline \end{array}$$

$$\begin{array}{r} .0386 \\ \times 2.3 \\ \hline \end{array}$$

**More practice:**

$$\begin{array}{r} 3875 \\ \times .008 \\ \hline \end{array}$$

$$\begin{array}{r} 56.021 \\ \times .0078 \\ \hline \end{array}$$

$$\begin{array}{r} .6529 \\ \times .426 \\ \hline \end{array}$$

$$\begin{array}{r} 72.412 \\ \times 725 \\ \hline \end{array}$$

$3 \times 5 = \underline{\hspace{2cm}}$

$.3 \times 5 = \underline{\hspace{2cm}}$

$.03 \times 5 = \underline{\hspace{2cm}}$

$.7 \times 8 = \underline{\hspace{2cm}}$

$.09 \times 6 = \underline{\hspace{2cm}}$

$5 \times .07 = \underline{\hspace{2cm}}$

$8 \times .08 = \underline{\hspace{2cm}}$

$7 \times .6 = \underline{\hspace{2cm}}$

$.003 \times 2 = \underline{\hspace{2cm}}$

$.6 \times 13 = \underline{\hspace{2cm}}$

$3 \times .004 = \underline{\hspace{2cm}}$

$.5 \times .9 = \underline{\hspace{2cm}}$

## DIVISION OF DECIMALS

Example:  $1.778 \div .25$

This can also be written as  $.25 \overline{)1.778}$

1. Move the decimal point in the divisor (.25) to the end of the number (after the last number). The decimal point must be moved the same number of places the dividend (1.778).

$$.25 \overline{)1.778}$$

2. Move the decimal point directly up in the bracket and it will be in the correct place in the answer.
3. Now divide the numbers.

$$\begin{array}{r} 7.112 \\ 25 \overline{)177.800} \end{array}$$

**Do the following:**

$$.8 \overline{)9.6}$$

$$.3 \overline{).282}$$

$$.6 \overline{)2.16}$$

$$.4 \overline{).0136}$$

$$.08 \overline{)112}$$

$$.03 \overline{)345}$$

$$.002 \overline{)14}$$

$$.03 \overline{).6}$$

$$.07 \overline{)8.4}$$

$$.005 \overline{)75}$$

$$.9 \overline{)20.7}$$

$$9 \overline{)4.5}$$

**More practice:**

$$.04 \overline{) .072}$$

$$1.2 \overline{) 324}$$

$$.22 \overline{) 184.8}$$

$$.05 \overline{) 53.5}$$

$$.16 \overline{) 2.08}$$

$$2.5 \overline{) .0625}$$

$$3.2 \overline{) 48}$$

$$.06 \overline{) 1.62}$$

$$1.7 \overline{) 2.21}$$

$$.23 \overline{) 1288}$$

$$.46 \overline{) 161}$$

$$.003 \overline{) .081}$$

$$.014 \overline{) .252}$$

$$.034 \overline{) 14.62}$$

$$.036 \overline{) 19.8}$$

$$12.71 \overline{) 185.566}$$

$$26.4 \overline{) 1071.84}$$

$$.0625 \overline{) .12}$$

## TEST YOURSELF!

$$31.9 + 42.8 + 6 + 29.007 = \underline{\hspace{2cm}}$$

$$3.72 - 1.79012 = \underline{\hspace{2cm}}$$

$$32.91 + .47 + 1.6 + 153 = \underline{\hspace{2cm}}$$

$$5.4 - 2.45 = \underline{\hspace{2cm}}$$

$$751 - 7.51 = \underline{\hspace{2cm}}$$

$$423 + .423 + 4.23 = \underline{\hspace{2cm}}$$

$$3.18 - 2.486 = \underline{\hspace{2cm}}$$

$$6 \times 24.1 = \underline{\hspace{2cm}}$$

$$44.1 \div 7 = \underline{\hspace{2cm}}$$

$$.007 \times 3.2 = \underline{\hspace{2cm}}$$

$$7.62 \div .065 = \underline{\hspace{2cm}}$$

$$4.21 \times 4.21 = \underline{\hspace{2cm}}$$

$$4.92 \div .012 = \underline{\hspace{2cm}}$$

$$1.3 \times .4163 = \underline{\hspace{2cm}}$$

## PERCENT

The term “per cent” and its symbol “%” both mean hundredths. A percent number is a fraction with a numerator already known and a denominator understood to be 100.

5% means 5 out of 100    **or**     $\frac{5}{100}$     **or**    .05

These are different ways of expressing the same amount.

To change % to decimal:

Move the decimal point two places to the left.

$$7\% = .07 \quad \frac{1}{2}\% = .5\% = .005$$

**To change % to a common fraction:**

Put the number over 100 and reduce    **or**    change to decimal and write as a fraction and reduce

$$5\% = \frac{5}{100} = \frac{1}{20} \quad \text{or} \quad 5\% = .05 = \frac{5}{100} = \frac{1}{20}$$

**Complete the following:**

FRACTION	DECIMAL	PER CENT
$\frac{1}{4}$		
	1.25	
		75%
$\frac{1}{8}$		
	.75	
		20%
$\frac{3}{25}$		
	.05	

A			

In this example B is a plot that has been divided into 8 equal Spaces. We shall call one of the spaces A.

**B**

B = the whole

A = the part

We want to know: **What % "A" is of "B"**

$$\% = \frac{\text{part}}{\text{whole}}$$

$$\% = \frac{A}{B} = \frac{1}{8} = .125 = 12.5\%$$

**What is  $12\frac{1}{2}\%$  of B?**

$$\text{Part} = \% \times \text{whole} \quad .125 \times 8 = A \quad .125 \times 8 = 1$$

A percent must always be changed to decimal form before multiplying or dividing with it.

**"A" is 12.5% of what?**

$$\text{Whole} = \frac{\text{part}}{\%} \quad B = \frac{A}{\%} = \frac{1}{.125} = 8$$

When looking for the percentage --  $\frac{\text{part}}{\text{whole}} = \%$

When looking for the part --  $\% \times \text{whole} = \text{part}$

When looking for the whole --  $\frac{\text{part}}{\%} = \text{whole}$

**Work the following:**

6 % of 300 = \_\_\_\_\_

$\frac{1}{2}\%$  of 840 = \_\_\_\_\_

2 is \_\_\_\_\_% of 20

What % of 25 is 15 \_\_\_\_\_

5% of 15 = \_\_\_\_\_

10 is \_\_\_\_\_% of 25

5 is  $\frac{1}{2}$ % of \_\_\_\_\_

8% of 2700 = \_\_\_\_\_

$2\frac{1}{2}$  is \_\_\_\_\_% of 8

3 is 30% of \_\_\_\_\_

200% of 6.7 = \_\_\_\_\_

.02% of 10 = \_\_\_\_\_

300 is 150% of \_\_\_\_\_

50% of 75 = \_\_\_\_\_

15 is 75% of \_\_\_\_\_

3% of 200 is \_\_\_\_\_

What % of 25 is 50 \_\_\_\_\_

60 is \_\_\_\_\_% of 75

16% of 320 = \_\_\_\_\_

$5\frac{1}{2}$ % of 2500 = \_\_\_\_\_

.97% of 800 = \_\_\_\_\_

20% of 63 = \_\_\_\_\_

65% of 90 = \_\_\_\_\_

400% of 65 = \_\_\_\_\_

.5% of 900 = \_\_\_\_\_

15 is \_\_\_\_\_% of 60

40 is 20% of \_\_\_\_\_

## RATIO AND PROPORTION

A **Ratio** indicates the relationship of one quantity to another.

It may be expressed as a fraction  $\frac{3}{9}$  or in colon form 3 : 9

Both forms mean exactly the same thing 3 out of 9. The fraction may be reduced to  $\frac{1}{3}$  meaning 1 out of 3.

Express the following ratios as fractions and reduce:

$$1 : 3 \underline{\hspace{2cm}} \qquad 5 : 7 \underline{\hspace{2cm}} \qquad 2 : 2000 \underline{\hspace{2cm}}$$

$$7 : 63 \underline{\hspace{2cm}} \qquad 42 : 83 \underline{\hspace{2cm}} \qquad 2 : 17 \underline{\hspace{2cm}}$$

$$7 : 56 \underline{\hspace{2cm}} \qquad 1 : 11 \underline{\hspace{2cm}} \qquad 2 : 150 \underline{\hspace{2cm}}$$

A **Proportion** shows the relationship between two equal ratios.

$$\frac{8}{16} = \frac{1}{2}$$

In the proportion problems in the course one term of the expression will be unknown. We will call that term "x".

$$\frac{8}{16} = \frac{x}{2}$$

To solve for x:

1. Cross multiply  $16x = 16$

2. Divide both sides by 16  $\frac{16x}{16} = \frac{16}{16}$

$$x = 1$$

Example:  $\frac{2}{x} = \frac{20}{30}$

1. Cross multiply  $20x = 60$

2. Divide both sides by 20  $x = 3$

**Solve the following proportion problems:**

$$\frac{2}{x} = \frac{10}{20} \quad x = \underline{\hspace{2cm}}$$

$$\frac{7}{30} = \frac{x}{60} \quad x = \underline{\hspace{2cm}}$$

$$\frac{20}{x} = \frac{30}{600} \quad x = \underline{\hspace{2cm}}$$

$$\frac{4}{7} = \frac{x}{49} \quad x = \underline{\hspace{2cm}}$$

$$\frac{10}{15} = \frac{x}{30} \quad x = \underline{\hspace{2cm}}$$

$$\frac{x}{5.2} = \frac{1.6}{8} \quad x = \underline{\hspace{2cm}}$$

$$\frac{x}{300} = \frac{2}{60} \quad x = \underline{\hspace{2cm}}$$

$$20:100 = 5:x \quad x = \underline{\hspace{2cm}}$$

$$\frac{6}{3000} = \frac{10}{x} \quad x = \underline{\hspace{2cm}}$$

$$\frac{x}{9} = \frac{2}{18} \quad x = \underline{\hspace{2cm}}$$

$$\frac{8}{24} = \frac{16}{x} \quad x = \underline{\hspace{2cm}}$$

$$\frac{32}{x} = \frac{8}{5} \quad x = \underline{\hspace{2cm}}$$

$$\frac{2.5}{x} = \frac{50}{60} \quad x = \underline{\hspace{2cm}}$$

$$\frac{.8}{10} = \frac{x}{.3} \quad x = \underline{\hspace{2cm}}$$

$$\frac{3.4}{x} = \frac{17}{25} \quad x = \underline{\hspace{2cm}}$$

$$\frac{3.2}{x} = \frac{.8}{.5} \quad x = \underline{\hspace{2cm}}$$

$$\frac{4}{8} = \frac{x}{72} \quad x = \underline{\hspace{2cm}}$$

$$\frac{x}{5} = \frac{.9}{15} \quad x = \underline{\hspace{2cm}}$$

$$\frac{3.5}{28} = \frac{6}{x} \quad x = \underline{\hspace{2cm}}$$

$$\frac{4}{24} = \frac{1}{x} \quad x = \underline{\hspace{2cm}}$$

$$\frac{4}{18} = \frac{20}{x} \quad x = \underline{\hspace{2cm}}$$

$$\frac{70}{1} = \frac{x}{21} \quad x = \underline{\hspace{2cm}}$$

### WORD PROBLEMS USING PROPORTIONS:

1. A washer in the lab can wash 100 flasks in 60 minutes. At this rate, how many flasks can be washed in 15 minutes?  
\_\_\_\_\_
2. To make a salt solution John uses .5 teaspoon of salt for each gallon of water. How much salt is used for 15 gallons of water?  
\_\_\_\_\_
3. Drugs may be used in many forms. One form is crystals. There are 3 parts boric acid in 12 parts of solution. Express the solution strength as a ratio. \_\_\_\_\_
4. The ratio strength of a Lysol solution is 1:20. If there are 1000 milliliters of solution, how many milliliters of Lysol are there?  
\_\_\_\_\_
5. A medical supplier sells 4 tongue depressors for 24 cents. What is the cost of 3 depressors? \_\_\_\_\_