Basic Math

From

PHARMACOLOGY MATH FOR THE PRACTICAL NURSE

U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
FORT SAM HOUSTON, TEXAS 78234-6100
PHARMACOLOGY MATH FOR THE
PRACTICAL NURSE
SUBCOURSE MD0904 EDITION 100
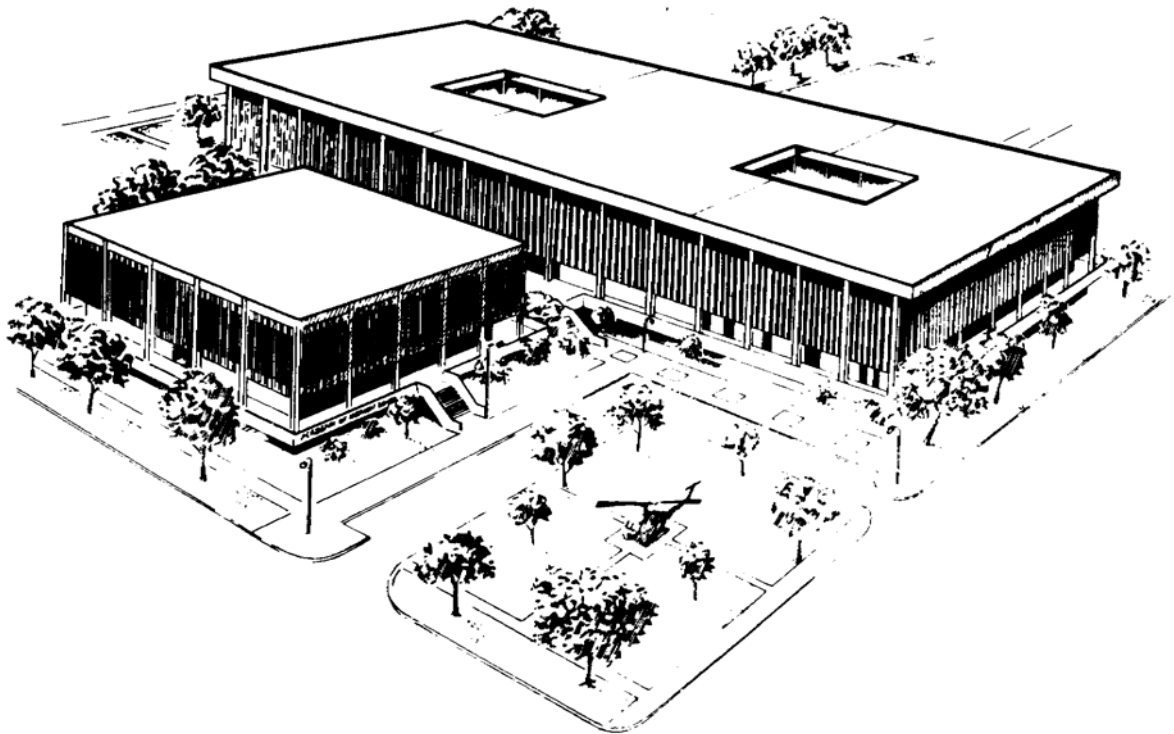
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Preface

Don't freak out- I know this is a math book for nurses but math is the same for everyone from teachers, nurses, engineers and welding inspectors. I have been looking for some cheap straight forward math class type stuff for people studying for the CWI Exam and this is what I stumbled across.

What I did is go through the aforementioned document and "weed out" things that I deemed are not so relevant to what the average weld inspector needs to know about basic mathematics

Bottom line- this document was written by the US Army to train nurses how to do math and I did some cutting to whittle it down to what is needed.

PHARMACOLOGY MATH FOR THE PRACTICAL NURSE

SUBCOURSE MD0904   **EDITION 100**

DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

ADMINISTRATION

For comments or questions regarding enrollment, student records, or shipments, contact the Nonresident Instruction Section at DSN 471-5877, commercial (210) 221-5877, toll-free 1-800-344-2380; fax: 210-221-4012 or DSN 471-4012, e-mail accp@amedd.army.mil, or write to:

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Approved students whose enrollments remain in good standing may apply to the Nonresident Instruction Section for subsequent courses by telephone, letter, or e-mail.

Be sure your social security number is on all correspondence sent to the Academy of Health Sciences.

CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.
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TABLE OF CONTENTS

SUBCOURSE MD0904

Pharmacology Math for the Practical Nurse

INTRODUCTION

One of the 91WM6's most important responsibilities is the safe administration of medication. Used intelligently and accurately, drugs can surely save countless numbers of lives; used unwisely, they can have disastrous results. It is imperative that you have a thorough understanding of the basic concepts of math as well as the specific mathematical skills required for pharmaceutical calculations.

Subcourse Components:

This subcourse consists of two lessons and a pretest. The lessons and pretest are:

Lesson1 Pretest.

Lesson 1, Basic Math.

Lesson 2, Pharmacology.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Section at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 12 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

PRETEST FOR LESSON 1

I. **COMMENTS**:   This pretest is designed to help you identify the topics (if any) you need to review/study before going on to Lesson 2 of this subcourse.

You alone will know how you performed on the pretest. Your pretest results will <u>not</u> affect your score on the final examination for the subcourse.

Do your best. How well you perform on the pretest will determine how much of Lesson 1 you will need to study/review before you go on to Lesson 2.

II. **INSTRUCTIONS**:   Please read and follow these instructions as closely as possible. The pay-off to you will be the wise use of your time.

STEP 1: Carefully read the instructions for the pretest.

STEP 2: Complete the 50-item pretest. Carefully read each item and write your answer in the space provided. Take as long as you need to complete the pretest.

STEP 3: Review your work. Be sure you wrote the correct answers.

STEP 4: Check your responses against the solutions following the pretest. Mark each of your responses as correct or incorrect.

STEP 5: Determine the number of items missed.

If you did not miss any items, you may skip Lesson 1 and proceed to Lesson 2.

If you missed only one or two items, read the paragraph(s) referenced to the right of the solution for each missed question to see why your answer was not correct. You may then proceed to Lesson 2.

If you missed more than two items, you should complete Lesson 1 before beginning Lesson 2.

NOTE: You may complete Lesson 1 even if you are not required to do so.

Continue with Exercises

PRETEST

NOTES

Throughout this subcourse, division may be indicated by " ÷ " or by " / " or by the phrase "divided by." For example "8 divided by 4" may be shown as " 8÷4" or "8/4."

"Divided into" may be represented by $\overline{)}$. **NOTE**: 4 divided into 8 ($4\overline{)8}$) is the same as 8 divided by 4 (8 ÷ 4).

Fractions may be shown in linear (3/7) or vertical ($\frac{3}{7}$) form.

Mixed numbers (whole number plus a fraction) may be shown in linear or vertical form.

For example, 3 7/8 and $3\frac{7}{8}$. Both mean three and seven-eights.

---

1.   19
      + 8

2. 23
      6
   +27

3. 4391
   +3019

4. 100
    - 23

5.   956
      -927

6. 48
   x 3

7. 85
   x 35

8. 9873 ÷ 9 =

9. 175 ÷ 7 =

10. 2385 ÷   25 =

11. Divide: $\frac{7}{8} \div \frac{1}{4}$ =

12. Divide: 6 ÷ $\frac{1}{3}$ =

13. Multiply: $\frac{5}{6}$ x $\frac{2}{3}$ =

14. Multiply: 8 x $\frac{2}{3}$ =

15. Multiply: $2\frac{1}{2}$ x $5\frac{1}{3}$ =

16. Divide: $6\frac{1}{2} \div 1\frac{1}{3}$ =

17. Change to a mixed number $\dfrac{6}{5}$ _____

18. Change to a whole number $\dfrac{28}{7}$ _____

19. Change to lowest terms $\dfrac{4}{8}$ _____

20. Change to an improper fraction $2\dfrac{4}{5}$ _____

21. Explain (put into words) 1.02 _____

NOTE: In answering items 22 through 30, round off to the 2nd decimal point.

22. Solve: 2.5 ÷ 2 =

23. Solve: 3.45 ÷ 10 =

24. Solve: 15 ÷ 1.3 =

25. Solve: 66 ÷ 2.5 =

26. Solve: 5.75 ÷ 0.25 =

27. Solve: 7.125 x 1.3 =

28. Solve: 6.01 x 7 =

29. Convert to decimals: $\dfrac{1}{6}$ =

30. Convert to decimals: $\dfrac{3}{5}$ =

31. Change 50% to a fraction. _____

32. Change $3\dfrac{1}{2}$ % to a fraction. _____

33. Change $\frac{1}{5}$ % to a fraction.   _____

34. Change $\frac{1}{8}$ to a percent.   _____

35. Change $\frac{1}{25}$ to a percent.   _____

36. Change 5% to a decimal.   _____

37. Change 2% to a decimal.   _____

38. Change $\frac{3}{4}$ % to a decimal.   _____

39. Change 0.1 to a percent.   _____

40. Change 0.05 to a percent.   _____

41. Write $\frac{1}{4}$ as a ratio.   _____

42. Write 1:3 as a percent.   _____ As a decimal.   _____

43. Write 1:150 as a percent.   _____ As a decimal.   _____

44. Change 10% to a ratio.   _____

45. Change 1% to a ratio.   _____

46. Change 80% to a ratio.   _____

47. Change 0.2 to a ratio.   _____

48. Change 0.025 to a ratio.   _____

49. Solve for x: 13:91 = x:14   _____

50. Solve for z: $\dfrac{z}{21} = \dfrac{5}{12}$ _____

Check Your Answers on Next Page

PRETEST ANSWERS

Following are the answers to the pretest you have just taken. Carefully check your pretest.

Basic Arithmetic

1. 27 (para 1-2)

2. 56 (para 1-2)

3. 7410 (para 1-2)

4. 77 (para 1-3)

5. 29 (para 1-3)

6. 144 (para 1-6)

7. 2975 (para 1-10)

8. 1097 (para 1-7)

9. 25 (para 1-7)

10. 95.4 or 95 2/5 (para 1-11)

Fractions

11. $3 \frac{1}{2}$ (paras 1-26, 1-18)

12. 18 (paras 1-26, 1-18)

13. $\frac{5}{9}$ (paras 1-23, 1-18)

14. $5 \frac{1}{3}$ (paras 1-24, 1-18)

15. $13 \frac{1}{3}$ (paras 1-25, 1-21, 1-18)

16.   4 $\frac{7}{8}$ (paras 1-26, 1-21, 1-18)

17.   1 $\frac{1}{5}$ (para 1-18)

18.   4 (para 1-18)

19. $\frac{1}{2}$ (para 1-17)

20. $\frac{14}{5}$ (para 1-21)

Decimals

21.   One and two hundredths (para 1-29)

22.   1.25 (para 1-31)

23.   0.345 = 0.35 (para 1-31)

24.   11.538 = 11.54 (para 1-31)

25.   26.4 (para 1-31)

26.   23 (para 1-31)

27.   9.2625 = 9.26 (para 1-34)

28.   42.07 (para 1-34)

29.   0.166 = 0.17 (para 1-36)

30.   0.6 (para 1-36)

Precentages

31. $\frac{50}{100}$ = $\frac{1}{2}$ (para 1-40)

32. $\dfrac{7}{200}$ (para 1-40)

33. $\dfrac{1}{500}$ (para 1-40)

34. $12\dfrac{1}{2}$ percent or 12.5 percent (para 1-41)

35. 4 percent (para 1-41)

36. 0.05 (para 1-42)

37. 0.02 (para 1-42)

38. 0.0075 (para 1-42)

39. 10% (para 1-43)

40. 5% (para 1-43)

Ration and Proportion

41. 1:4 (para 1-46)

42. $33\dfrac{1}{3}$ percent ; 0.33 (para 1-47)

43. $\dfrac{2}{3}$% ; 0.0067 (para 1-47)

44. 1:10 (para 1-50)

45. 1:100 (para 1-50)

46. 4:5 (para 1-50)

47. 1:5 (para 1-51)

48. 1:40 (para 1-51)

49. x = 2 (para 1-55)

50. z = 8.75 (para 1-55)

End of Lesson 1 Pretest

LESSON ASSIGNMENT

LESSON 1　　　　　　Basic Math.

TEXT ASSIGNMENT　　　Paragraphs 1-1 through 1-57.

LESSON OBJECTIVES　　After completing this lesson, you should be able to:

　　　　　　1-1.　Add, subtract, multiply, and divide whole numbers.

　　　　　　1-2.　Reduce fractions to lowest terms.

　　　　　　1-3.　Change improper fractions to mixed numbers or whole numbers and mixed numbers to improper fractions.

　　　　　　1-4.　Add, subtract, multiply, and divide fractions and mixed numbers.

　　　　　　1-5.　Add, subtract, divide, and multiply decimals.

　　　　　　1-6.　Change decimals to fractions and fractions to decimals.

　　　　　　1-7.　Solve problems using the ratio and proportion method.

SUGGESTION　　　　　After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 1

BASIC MATH

Section I. Basic Arithmetic

1-1. GENERAL

a. **Whole Numbers.** The number zero and the counting numbers (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, ...) are **whole numbers**. The first 10 whole numbers (0 through 9) are called **digits**.

b. **Powers of Ten.** Our number system is based upon the powers of ten. That is, the digit place to the immediate left of a given digit is worth ten times as much as the given digit place, and the digit place to the immediate right is worth one-tenth as much. For example, in the number 321, the one tells you how many ones (or units) are in the number, the two tells how many tens, and the three tells how many hundreds. See figure 1-1.
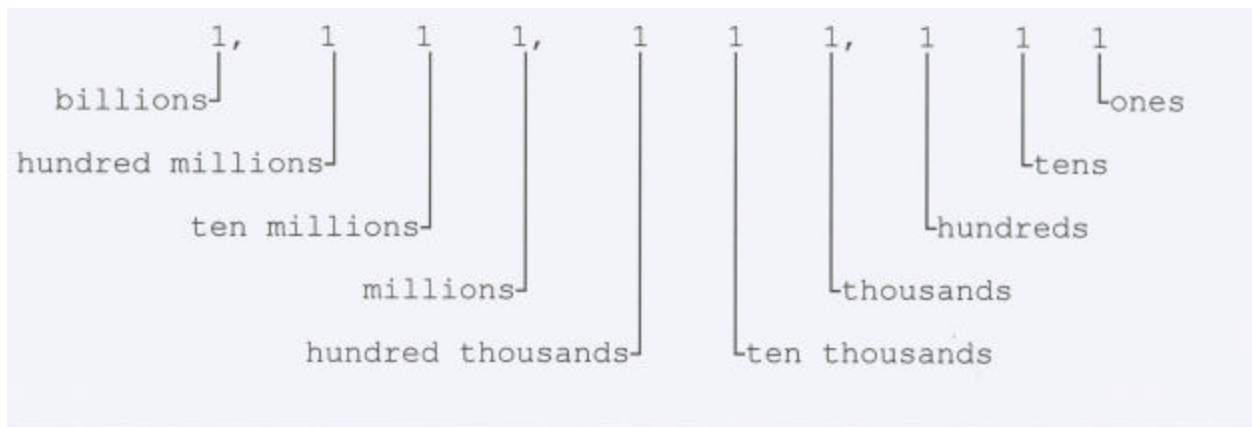

Figure 1-1. The number system.

1-2. SIMPLE ADDITION

a. The numbers to be added are the addends. The answer to an addition problem is the sum. When you are doing a problem in addition, work from right to left. Be sure to keep the columns of numbers in straight lines.

b. When you "carry" a number over to the next column to the left, you can jot it down at the top of the column.

EXAMPLE: Find the sum of 263, 19, and 1202.

$$
\begin{array}{r}
{\scriptstyle 1} \quad \text{(the 1 is "carried")} \\
263 \quad \text{(addend)} \\
19 \quad \text{(addend)} \\
+1202 \quad \text{(addend)} \\
\hline
1484 \quad \text{(sum)}
\end{array}
$$

1-3. SIMPLE SUBTRACTION

a.   The number "from which" another number is taken away is the "minuend." The number that is taken away is the "subtrahend." The answer is the "difference."

EXAMPLE: Subtract 4 from 17.

$$
\begin{array}{l}
17 \ \text{(minuend)} \\
\underline{-4} \ \text{(subtrahend)} \\
13 \ \text{(difference)}
\end{array}
$$

b.   When you are doing a problem in subtraction, always remember to keep the columns of numbers in straight lines.

c.   If the minuend in any column is smaller than the subtrahend, you can "borrow" from the next column to the left. This gives you ten more to work with in the right hand column but one less in the left hand column from which you have borrowed.

EXAMPLE: What is 35 minus 28?

$$
\begin{array}{l}
35 \\
\underline{-28}
\end{array}
$$

To do the problem above, you have to change the 5 in the minuend to 15, and subtract 1 from 3 in the minuend.

$$
\begin{array}{l}
{\scriptstyle 2\,1} \ \text{(10 is "borrowed")} \\
3\,5 \\
\underline{-2\,8} \\
7
\end{array}
$$

1-4. PRACTICE 1-1

DIRECTIONS: Complete the following problems. The answers are in paragraph 1-5 on the following page. If you miss two or more problems, review the section again before proceeding with the subcourse. Follow the same instructions for the other practice exercises in the lesson.

a. Find the sum of 29 and 13.

b. Add 8 and 49.

c. 109 + 309 =

d. Add 13, 318, and 5.

e. What is the sum of 1713 and 1694?

f. Subtract 19 from 73.

g. 83 - 47 =

h. Subtract 233 from 2011.

i. From 220, subtract 59.

j. What is 100 - 39?

1-5. ANSWERS TO PRACTICE 1-1

a.
$$\begin{array}{r} {}^{1} \\ 29 \\ +13 \\ \hline 42 \end{array}$$

b.
$$\begin{array}{r} {}_{1}8 \\ +49 \\ \hline 57 \end{array}$$

c.
$$\begin{array}{r} {}^{1} \\ 109 \\ +309 \\ \hline 418 \end{array}$$

d.
$$\begin{array}{r} {}^{1} \\ 13 \\ 318 \\ +\ 5 \\ \hline 336 \end{array}$$

e.
$$\begin{array}{r} {}^{1\,1} \\ 1713 \\ 1694 \\ \hline 3407 \end{array}$$

f.
$$\overset{\text{6 1}}{73}$$
$$\underline{-19}$$
$$54$$

g.
$$\overset{\text{7 1}}{83}$$
$$\underline{-47}$$
$$36$$

h.
$$\overset{\text{1 9 10 1}}{2\,0\,1\,1}$$
$$\underline{-\,2\,3\,3}$$
$$1\,7\,7\,8$$

i.
$$\overset{\text{1 11 1}}{2\,2\,0}$$
$$\underline{-\,5\,9}$$
$$1\,6\,1$$

j.
$$\overset{\text{0 9 1}}{1\,0\,0}$$
$$\underline{-\,3\,9}$$
$$6\,1$$

1-6. SIMPLE MULTIPLICATION

A number being multiplied is a "factor." The answer to a multiplication problem is a "product." When you multiply, a good habit is to keep the numbers in straight columns. This will help you in long multiplication problems.

EXAMPLE: Multiply 36 by 6.

$$36 \text{ factor}$$
$$\underline{x\,6} \text{ factor}$$

To work the problem above, follow these steps:

a. Multiply: 6 x 6 = 36. Write down the 6 and "carry" the 3.

$$\overset{3}{36}$$
$$\underline{x\,6}$$
$$6$$

b.   Multiply: 3 x 6 = 18. Add 3 (the number carried) to 18. 3+18 = 21.

$$\begin{array}{r} 36 \\ \times\,6 \\ \hline 216 \end{array}$$

1-7.   SIMPLE DIVISION

a.   The number "being divided" is the <u>dividend</u>. The number you are "dividing by" is the <u>divisor</u>. The answer is the <u>quotient</u>.

EXAMPLE:

$$\text{(divisor)}\ 6)\overline{12}\ \text{(dividend)}\quad \underline{2}\ \text{(quotient)}$$

b.   Anything left over is the <u>remainder</u>.

EXAMPLE:

$$\begin{array}{r} 2 \\ 6)\overline{13} \\ \underline{12} \\ 1\ \text{(remainder)} \end{array}$$

c.   The remainder can always be written as a fraction. The remainder becomes the numerator and the divisor becomes the denominator. Thus, the remainder in the problem above is 1/6. The quotient is 2 1/6.

1-8.   PRACTICE 1-2

a.   What is 53 times 3?

b.   Multiply 1139 x 2.

c.   209 x 6 =

d.   What is the product of 27 and 8?

e.   What is 120 x 7?

f.   Divide 64 by 8.

g.   What is the quotient when 315 is divided by 5?

h.   3)$\overline{18}$

i.   How many times does 8 go into 4248?

j.   4)$\overline{139}$

1-9.   ANSWERS TO PRACTICE 1-2

a.   53
     x 3
     159

b. $\overset{1}{1}139$
      x 2
     2278

c. $\overset{5}{2}09$
     x 6
     1254

d. $\overset{5}{2}7$
     x 8
     216

e. $\overset{1}{1}20$
     x 7
     840

f.   8)$\overline{64}$ $\underline{8}$
        64
         0

g.   5)$\overline{315}$ $\underline{63}$
        30
        15
        15
         0

h.   6
   3)18
     18
      0

i.   531
   8)4248
     40
      24
      24
       08
        8
        0

j.   34 3/4
   4)139
     12
      19
      16
       3

1-10. LONG MULTIPLICATION

a.   The following procedure is used for multiplying factors with two or more digits.

EXAMPLE: Multiply 35 by 25.

$$
\begin{array}{r}
35 \text{ factors} \\
\times\ 25 \\
\hline
175 \text{ subproducts} \\
\underline{700} \\
875 \text{ product}
\end{array}
$$

STEPS followed in the problem above:

(1)   Begin on the right and work left.

(2)   First multiply 35 by 5. 5 x 5 is 25. Write down 5 in the unit column and carry the 2.

$$
\begin{array}{r}
^{2}\quad \\
35 \\
\underline{\times 25} \\
5
\end{array}
$$

(3)   5 x 3 = 15. 15 + 2 = 17. Write down 17 to the left of the 5. The first
       subproduct is 175.

$$\begin{array}{r} 35 \\ \underline{\times 25} \\ 175 \end{array}$$

(4)   Next, multiply 35 by 20. Place a zero in the ones (units) column and
       then multiply by 2. 2 x 5 = 10. Write down 0 and carry the 1.

$$\begin{array}{r} 35 \\ \underline{\times\ 25} \\ 175 \\ 00 \end{array}$$

(5)   2 x 3 is 6. 6 + 1 = 7. Write down 7 next to the 0. The second
       subproduct is 700.

$$\begin{array}{r} 35 \\ \underline{\times\ 25} \\ 175 \\ 700 \end{array}$$

(6)   Add the two subproducts. 175 + 700 = 875. This is the product.

$$\begin{array}{r} 35 \\ \underline{\times\ 25} \\ 175 \\ \underline{700} \\ 875 \end{array}$$

b.   When multiplying any factor by 10, 100, 1000 and so on, add to the factor the
same number of zeros that are in the second factor.

   EXAMPLE: Multiply 93 by 10. There is one zero in the 10.
                 Therefore, add one zero to 93.
                 93 x 10 = 930.

1-11. LONG DIVISION

There are several techniques for doing long division. You may be used to a different technique from the one shown below. If you prefer another way, use it.

EXAMPLE: Divide 875 by 25.

```
      35
25)875
   75
  125
  125
    0
```

STEPS followed in the problem above:

(1)   Try to divide 25 into 87. About how many times will 25 go into 87?
        The answer is more than 3 but less than 4.

```
25)875
```

(2)   Write down 3 in the space for the quotient, directly above the 7.

```
      3
25)875
```

(3)   Now multiply 3 x 25 and write the answer under the 87. (3 x 25 = 75)
        Write 75 under the 87.

```
   1  3
25)875
   75
```

(4)   Subtract 75 from 87. The difference is 12. Write 12 directly under the
        75.

```
      3
25)875
   75
   12
```

(5)   Now "bring down" the 5 from the dividend. The 12 becomes 125.

```
      3
25)875
   75
  125
```

(6)   Divide 125 by 25. The answer is 5. Write 5 in the space for the quotient, to the right of the 3.

$$\begin{array}{r} 35 \\ 25\overline{)875} \\ 75 \\ \overline{125} \end{array}$$

(7)   Multiply 5 x 25 and write the answer under the 125. (5 x 25 = 125)

$$\begin{array}{r} {}^{2}\ \ 35 \\ 25\overline{)875} \\ 75 \\ \overline{125} \\ \underline{125} \end{array}$$

(8)   Subtract from 125. The difference is zero. Therefore, the quotient is exactly 35.

$$\begin{array}{r} 35 \\ 25\overline{)875} \\ \underline{75} \\ 125 \\ \underline{125} \\ 0 \end{array}$$

1-12. PRACTICE 1-3

a.   Multiply 284 by 12.   _____

b.   What is the product of 310 and 219?   _____

c.   Multiply 112 by 82.   _____

d.   Multiply 527 by 277.   _____

e.   331 x 105 =   _____

f.   Divide 612 by 12.   _____

g.   Divide 3928 by 491.   _____

h.   If 3000 is divided by 75, what is the quotient?   _____

i.   If 360 is divided by 25, what is the quotient?   _____

j.   Divide 1425 by 15. _____

1-13. ANSWERS TO PRACTICE 1-3

a.   284
     x112
     ^{1}568
     ^{1}284
     3408

b.   310
     x 219
     2790
     310
     620
     67890

c.   112
     x 82
     224
     ^{1}896
     9184

d.   527
     x 277
     3689
     3689
     1054
     145979

e.   331
     x 105
     1655
     3310
     34755

f.   51
     12)612
         60
         12
         12
          0

g. $_7$ 8
     491)3928
         3928
            0

h.   40
     75)3000
        300
         00
         00
          0

i.   14.4 or   14 $\frac{10}{25} = 14\frac{2}{5}$
     ^{2}25)360.0 ^{2}25)360
         25   25
        110   110
        100   100
        100   10
        100
          0

j.   95
     15)1425
        135
         75
         75
          0

Section II. FRACTIONS

1-14. DEFINITION

A fraction is less than a whole amount. A whole number may be divided into one or more equal parts. It is expressed by two numbers separated by a line.

EXAMPLES: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{4}{5}$, $\frac{5}{6}$.

1-15. PARTS OF FRACTIONS

The parts of a fraction are the <u>numerator</u>, or upper number, and the <u>denominator</u>, or bottom number.

EXAMPLE: In the fraction $\frac{1}{3}$, the "1" is the numerator, and the "3" is the denominator.

1-16. KINDS OF FRACTIONS

a.   A <u>proper fraction</u> has a numerator that is <u>smaller</u> than the denominator.

EXAMPLES: The fraction $\frac{1}{4}$ is a proper fraction because the numerator, "1" is smaller than the denominator. "4."

Other examples are: $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{7}{8}$.

b.   An improper fraction has a numerator that is <u>larger</u> than the denominator or <u>equal to</u> the denominator.

EXAMPLES: The fraction $\frac{4}{3}$ is an improper fraction because the numerator "4" is larger than the denominator "3."

Other examples are $\frac{9}{2}$, $\frac{5}{3}$, and $\frac{3}{3}$.

c.   A <u>mixed number</u> is made up of a whole number and a fraction.

EXAMPLES: $2\frac{3}{4}$ is a mixed number because it has a whole number "2" and a fraction "3/4".

Other examples are: $3\frac{1}{4}$, $1\frac{1}{3}$, and 4 1/8.

1-17. CHANGING FRACTIONS TO LOWEST POSSIBLE TERMS

Some fractions can (and should) be changed (reduced) to their lowest terms. This is done by dividing the numerator and denominator by the same number. This should be the largest possible number that will go into the numerator and denominator. A fraction is said to be at its lowest terms when the numerator and denominator cannot be divided by the same number to arrive at a lower numerator and denominator.

EXAMPLE: Reduce the fraction $\frac{9}{12}$.

What number goes into 9 and 12 evenly?
The answer is 3.
Divide the numerator by 3. 9 divided by 3 = 3.

$$\frac{9}{12} = \frac{3}{}$$

Divide the denominator by 3. 12 divided by 3 = 4.

$$\frac{9}{12} = \frac{3}{4}$$

Therefore, $\frac{9}{12}$ can be reduced to $\frac{3}{4}$.

These two fractions are equal in value.

Remember, reducing does not change the value of a fraction.

1-18. CHANGING IMPROPER FRACTIONS TO MIXED NUMBERS OR WHOLE NUMBERS

Improper fractions are changed to mixed or whole numbers by dividing the numerator by the denominator.

EXAMPLES: $\frac{8}{4} = 8 \div 4 = 2$ (a whole number)

$\frac{6}{5} = 6 \div 5 = 1\frac{1}{5}$ (a mixed number)

1-19. PRACTICE 1-4

a.   Identify the following as proper fractions, improper fractions, or mixed numbers:

(1) 7 $\frac{1}{5}$ _____

(2) $\frac{1}{3}$ _____

(3) $\frac{100}{150}$ _____

(4) $\frac{30}{10}$ _____

(5) $\frac{119}{200}$ _____

(6) 6 $\frac{1}{5}$ _____

   b. Change these proper fractions to their lowest terms:

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

     (2) $\frac{25}{75}$ =

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

     (4) $\frac{8}{32}$ =

     (5) $\frac{5}{15}$ =

     (6) $\frac{6}{18}$ =

   c. Change the following improper fractions to whole or mixed numbers:

     (1) $\frac{4}{2}$ =   (4) $\frac{9}{7}$ =

     (2) $\frac{30}{5}$ =   (5) $\frac{15}{10}$ =

     (3) $\frac{14}{12}$ =   (6) $\frac{9}{6}$ =

1-20. ANSWERS TO PRACTICE 1-4

   a. (1) Mixed

(2) Proper

(3) Proper

(4) Improper

(5) Proper

(6) Mixed

b. (1) $\dfrac{2}{8} = \dfrac{1}{4}$ $(2 \div 2 = 1)$
$(8 \div 2 = 4)$

(2) $\dfrac{25}{75} = \dfrac{1}{3}$ $(25 \div 25 = 1)$
$(75 \div 25 = 3)$

(3) $\dfrac{3}{9} = \dfrac{1}{3}$ $(3 \div 3 = 1)$
$(9 \div 3 = 3)$

(4) $\dfrac{8}{32} = \dfrac{1}{4}$ $(8 \div 8 = 1)$
$(32 \div 8 = 4)$

(5) $\dfrac{5}{15} = \dfrac{1}{3}$ $(5 \div 5 = 1)$
$(15 \div 5 = 3)$

(6) $\dfrac{6}{18} = \dfrac{1}{3}$ $(6 \div 6 = 1)$
$(18 \div 6 = 3)$

c. (1) $\dfrac{4}{2} = 2$ $(4 \div 2 = 2)$

(2) $\dfrac{30}{5} = 6$ $(30 \div 5 = 6)$

(3) $\dfrac{14}{12} = 1\dfrac{1}{6}$ $(14 \div 12 = 1\dfrac{1}{6})$

(4) $\dfrac{9}{7} = 1\dfrac{2}{7}$ $(9 \div 7 = 1\dfrac{2}{7})$

(5) $\dfrac{15}{10} = 1\dfrac{1}{2}$ $(15 \div 10 = 1\dfrac{1}{2})$

(6) $\dfrac{9}{6} = 1\dfrac{1}{2}$ $(9 \div 6 = 1\dfrac{1}{2})$

1-21. CHANGING MIXED NUMBERS TO IMPROPER FRACTIONS

Mixed numbers may be changed to improper fractions by:

a. Multiplying the whole number by the denominator of the fraction.

b. To this answer, adding the numerator of the fraction.

c. Placing this sum (or answer) over the denominator of the fraction.

EXAMPLE: Change $4\frac{2}{3}$ to an improper fraction.

STEPS: (1) 4 (whole number) x 3 (denominator) = 12

$$4\frac{2}{3} = \frac{12}{}$$

(2) 12 (answer from ABOVE) + 2 (numerator) = 14

$$4\frac{2}{3} = \frac{12}{} + 2 = \frac{14}{}$$

(3) 14 is placed over denominator $= \frac{14}{3}$

Thus $4\frac{2}{3} = \frac{12+2}{3} = \frac{14}{3}$

1-22. ADDITION AND SUBTRACTION OF FRACTIONS

a. When you add and subtract fractions, the denominators of these fractions must be the same. To make the denominators of two fractions the same, you have to find the smallest denominator into which each of the original denominators will divide evenly. This is the lowest common denominator.

EXAMPLE: You are given the fractions $\frac{1}{2}$ and $\frac{1}{5}$ and are asked to find the lowest common denominator.

What is the smallest number into which 2 and 5 will divide evenly?

The answer is 10. 10 is the lowest common denominator.

You must now change your fractions to tenths.

$$\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} \qquad \frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

REMEMBER: The new fractions are the same in value as the old fractions.

b. <u>To add fractions</u>, find the lowest common denominator and change the fractions to fractions having the same denominator. Then add the numerators.

EXAMPLE: $\frac{1}{3} + \frac{3}{4} = ?$

Change fractions to the lowest common denominator.
Then add the numerators.

$$\frac{1}{3} = \frac{4}{12}$$

$$\frac{3}{4} = \frac{9}{12}$$

$$\frac{4}{12} + \frac{9}{12} = \frac{13}{12} \text{ or } 1\frac{1}{12}$$

c. <u>To subtract fractions</u>, again find the lowest common denominator and change the fractions to fractions having the same denominator. Then, subtract the second numerator from the first numerator.

EXAMPLE: $\frac{3}{4} - \frac{1}{3} = ?$

$$\frac{3}{4} = \frac{9}{12}$$

$$\frac{1}{3} = \frac{4}{12}$$

$$\frac{9}{12} - \frac{4}{12} = \frac{9-4}{12} = \frac{5}{12}$$

1-23. MULTIPLYING TWO FRACTIONS

Two fractions may be multiplied by:

a. Multiplying the numerators.

b. Multiplying the denominators.

c. Reducing the answer to lowest possible terms.

EXAMPLE: $\dfrac{3}{4} \times \dfrac{2}{5} = \dfrac{3 \times 2}{4 \times 5} = \dfrac{6}{20} = \dfrac{3}{10}$ (reduced to lowest possible terms).

1-24. MULTIPLYING WHOLE NUMBERS AND FRACTIONS

Whole numbers and fractions may be multiplied by:

a. Changing the whole number to an improper fraction.

b. Multiplying the two fractions.

c. Reducing the answer to a mixed number in its lowest possible terms.

EXAMPLE: $4 \times \dfrac{2}{3} = \dfrac{4}{1} \times \dfrac{2}{3} = \dfrac{8}{3} = 2\dfrac{2}{3}$

1-25. MULTIPLYING MIXED NUMBERS

Mixed numbers may be multiplied by:

a. Changing the mixed numbers to improper fractions.
b. Multiplying the two fractions.

c. Reducing the answer to a mixed number in its lowest possible terms.

EXAMPLE: $2\dfrac{1}{2} \times 4\dfrac{1}{3} = \dfrac{5}{2} \times \dfrac{13}{3} = 5 \times \dfrac{13}{2} \times 3 = \dfrac{65}{6} = 10\dfrac{5}{6}$

1-26. DIVIDING FRACTIONS

Fractions may be divided by:

a. Inverting the divisor (the number by which another number is divided). Inverting is done by reversing the upper number and the lower number of the fraction.

b. After inverting the divisor, multiplying.

c. Reducing the answer to lowest terms (and/or a mixed number).

EXAMPLES: $\dfrac{3}{4} \div \dfrac{2}{3} = \dfrac{3}{4} \times \dfrac{3}{2} = \dfrac{9}{8} = 1\dfrac{1}{8}$

$\dfrac{1}{3} \div \dfrac{1}{5} = \dfrac{1}{3} \times \dfrac{5}{1} = \dfrac{5}{3} = 1\dfrac{2}{3}$

$4\dfrac{1}{2} \div \dfrac{1}{3} = \dfrac{9}{2} \times \dfrac{3}{1} = \dfrac{27}{2} = 13\dfrac{1}{2}$

1-27. PRACTICE 1-5

NOTE: Remember to reduce answers to lowest terms when possible.

a. Change the following mixed numbers to improper fractions:

(1) $2\dfrac{3}{8}$ =

(2) $5\dfrac{1}{5}$ =

(3) $10\dfrac{2}{3}$ =

(4) $8\dfrac{1}{6}$ =

(5) $4\dfrac{1}{2}$ =

(6)   2   =

b. Multiply the following fractions:

(1) $\dfrac{5}{6} \times \dfrac{1}{.3}$ =

(2) $\dfrac{9}{10} \times \dfrac{3}{4}$ =

(3) $\dfrac{5}{8} \times \dfrac{1}{2}$ =

(4) $\dfrac{7}{8} \times \dfrac{2}{5}$ =

(5) $\dfrac{4}{5} \times \dfrac{3}{5} =$

(6) $\dfrac{1}{3} \times \dfrac{3}{8} =$

c.   Multiply the following whole numbers and fractions:

(1) $7 \times \dfrac{1}{2} =$

(2) $10 \times \dfrac{1}{3} =$

(3) $11 \times \dfrac{1}{4} =$

(4) $9 \times \dfrac{2}{3} =$

(5) $15 \times \dfrac{2}{3} =$

(6) $6 \times \dfrac{1}{8} =$

d.   Multiply the following mixed numbers:

(1) $3\dfrac{3}{5} \times 2\dfrac{1}{2} =$

(2) $9 \times 9\dfrac{1}{2} =$

(3) $3\dfrac{1}{8} \times 2\dfrac{1}{4} =$

(4) $2\dfrac{1}{4} \times 3\dfrac{1}{3} =$

(5) $5 \times 4\dfrac{1}{4} =$

(6) $8\dfrac{2}{3} \times 5\dfrac{1}{4} =$

e. Divide the following fractions and mixed numbers:

(1) $1\frac{1}{3} \div \frac{1}{2} =$

(2) $6 \div \frac{1}{3} =$

(3) $6\frac{1}{2} \div 2 =$

(4) $\frac{3}{4} \div \frac{1}{2} =$

(5) $7\frac{1}{2} \div 5\frac{1}{5} =$

(6) $8 \div \frac{1}{4} =$

1-28. ANSWERS TO PRACTICE 1-5

a. (1) $2\frac{3}{8} = \frac{19}{8}$ (2 x 8 = 16 + 3 = 19)

(2) $5\frac{1}{5} = \frac{26}{5}$ (5 x 5 = 25 + 1 = 26)

(3) $10\frac{2}{3} = \frac{32}{3}$ (10 x 3 = 30 + 2 = 32)

(4) $8\frac{1}{6} = \frac{49}{6}$ (8 x 6 = 48 + 1 = 49)

(5) $4\frac{1}{2} = \frac{9}{2}$ (4 x 2 = 8 + 1 = 9)

(6) $2 = \frac{2}{1}$

b. (1) $\frac{5}{6} \times \frac{1}{3} = \frac{5}{18}$ (5 x 1 = 5)
(6 x 3 = 18)

(2) $\frac{9}{10} \times \frac{3}{4} = \frac{27}{40}$ (9 x 3 = 27)
(10 x 4 = 40)

(3) $\frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$ (5 x 1 = 5)

                      (8 x 2 = 16)

(4) $\frac{7}{8} \times \frac{2}{5} = \frac{14}{40} = \frac{7}{20}$ (7 x 2 = 14)   (14 ÷ 2 = 7)

                                (8 x 5 = 40)   (40 ÷ 2 = 20)

(5) $\frac{4}{5} \times \frac{3}{5} = \frac{12}{25}$ (4 x 3 = 12)

                      (5 x 5 = 25)

(6) $\frac{1}{3} \times \frac{3}{8} = \frac{3}{24} = \frac{1}{8}$ (1 x 3 = 3)   (3 ÷ 3 = 1)

                            (3 x 8 = 24)   (24 ÷ 3 = 8)

c. (1) $7 \times \frac{1}{2} = \frac{7}{2} = 3\frac{1}{2}$ (7 x 1 = 7)   ($7 \div 2 = 3\frac{1}{2}$)

                                (1 x 2 = 2)

(2) $10 \times \frac{1}{3} = \frac{10}{3} = 3\frac{1}{3}$

(3) $11 \times \frac{1}{4} = \frac{11}{4} = 2\frac{3}{4}$

(4) $9 \times \frac{2}{3} = \frac{18}{3} = 6$ (or $\overset{3}{\cancel{9}} \times \frac{2}{\cancel{3}_1} = 6$)

(5) $15 \times \frac{2}{3} = \frac{30}{3} = 10$ (or $\overset{5}{\cancel{15}} \times \frac{2}{\cancel{3}_1} = 10$)

(6) $6 \times \frac{1}{8} = \frac{6}{8} = \frac{3}{4}$ (or $\overset{3}{\cancel{6}} \times \frac{1}{\cancel{8}_4} = \frac{3}{4}$)

d. (1) $3\frac{3}{5} \times 2\frac{1}{2} = \frac{18}{5} \times \frac{5}{2} = \frac{90}{10} = 9$ (or $\overset{9}{\cancel{18}} \times \frac{\overset{1}{\cancel{5}}}{\cancel{2}_1} = \frac{9}{1} = 9$)

(2) $9 \times 9\frac{1}{2} = \frac{9}{1} \times \frac{19}{2} = \frac{171}{2} = 85\frac{1}{2}$

(3) $3\frac{1}{8} \times 2\frac{1}{4} = \frac{25}{8} \times \frac{9}{4} = \frac{225}{32} = 7\frac{1}{32}$

(4) $2\frac{1}{4} \times 3\frac{1}{3} = \frac{9}{4} \times \frac{10}{3} = \frac{90}{12} = 7\frac{6}{12} = 7\frac{1}{2}$ (or $\overset{3}{\cancel{9}} \times \frac{\overset{5}{\cancel{10}}}{\cancel{3}_1} = 15$)

(5) $5 \times 4\frac{1}{4} = \frac{5}{1} \times \frac{17}{4} = \frac{85}{4} = 21\frac{1}{4}$

(6) $8\frac{2}{3} \times 5\frac{1}{4} = \frac{26}{3} \times \frac{21}{4} = \frac{546}{12} = 45\frac{6}{12} = 45\frac{1}{2}$ or $\frac{\overset{13}{\cancel{26}} \times \overset{7}{\cancel{21}}}{\underset{1}{\cancel{3}} \; \underset{2}{\cancel{4}}} = \frac{91}{2}$

e. (1) $1\frac{1}{3} \div \frac{1}{2} = \frac{4}{3} \times \frac{2}{1} = \frac{8}{3} = 2\frac{2}{3}$

(2) $6 \div \frac{1}{3} = \frac{6}{1} \times \frac{3}{1} = \frac{18}{1} = 18$

(3) $6\frac{1}{2} \div 2 = \frac{13}{2} \times \frac{1}{2} = \frac{13}{4} = 3\frac{1}{4}$

(4) $\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$ $\left(\text{or } \frac{3}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{1} = \frac{3}{2} = 1\frac{1}{2}\right)$

(5) $7\frac{1}{2} \div 5\frac{1}{5} = \frac{15}{2} \times \frac{5}{26} = \frac{75}{52} = 1\frac{23}{52}$

(6) $8 \div \frac{1}{4} = \frac{8}{1} \times \frac{4}{1} = \frac{32}{1} = 32$

Section III. DECIMALS

1-29. DEFINITION

a.   The word "decimal" means ten. A decimal is a fraction whose denominator is ten or a multiple of ten.

b.   All the numbers written to the left of the "decimal point" (a dot) are whole numbers. The numbers written to the right of the decimal point are "decimals" (less than one).

c.   The first place to the right of the decimal point is for tenths, the second place for hundredths, the third for thousandths, and so forth.
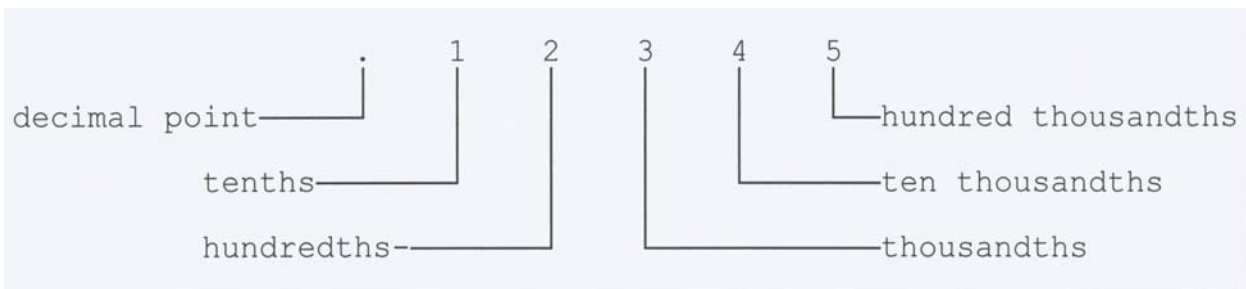

Figure 1-2. The decimal system.

EXAMPLES:　0.1　= one tenth

0.01　= one hundredth

0.001 = one thousandth

1.0　= one

10.0　= ten

100.0　= one hundred

1.1　= one and one tenth

10.01　= ten and one hundredth

1-30.　ADDITION AND SUBTRACTION OF DECIMALS

When adding and subtracting decimals, remember to keep all the decimal points directly underneath each other.

EXAMPLE:　Add 13.102, 1.73, and .47.

```
  13.102
   1.73
+   .47
  15.302
```

EXAMPLE:　Subtract 4.56 from 8.2.

What you will need to do is change 8.2 to 8.20.　(Remember, you can always add a zero to the end of a decimal without changing its value).

```
 8.20
-4.56
 3.64
```

1-31.　DIVIDING DECIMALS

a.　A decimal may be divided by a whole number by dividing in the usual manner and placing the decimal point in the answer directly above the decimal point in the number to be divided.

EXAMPLE:　5.5 ÷ 5 = 1.1

$$\begin{array}{r} 1.1 \\ 5)\overline{5.5} \\ \underline{5} \\ 5 \\ \underline{5} \\ 0 \end{array}$$

b. A whole number may be divided by a decimal by:

   (1)   Making the divisor a whole number by moving the decimal point to the right as many places as necessary.

   (2)   Placing a decimal point after the whole number (dividend) and then moving the decimal point the same number of places to the right as the decimal point in the divisor was moved.

   (3)   Divide in the usual manner.

   EXAMPLE: $55 \div 0.2$

   $$0.2)\overline{55} \;=\; 0.2.)\overline{55.0.} \;=\; 02)\overline{550.}$$

   Thus, $55 \div 0.2 = 275$

c. Now to divide a decimal by a decimal, all we do is:

   (1)   Make the divisor a whole number.

   (2)   Move the decimal point in the dividend the same number of places as the decimal in the divisor was moved.

   (3)   Place the decimal point in the quotient directly above the decimal point in the dividend.

   (4)   Divide in the usual manner.

   EXAMPLE: $5.25 \div 2.5 =$

   $$2.5.)\overline{5.2.5} \;=\; 25)\overline{52.5} = 2.1$$

   Thus $5.25 \div 2.5 = 2.1$

d. If a decimal is to be divided by a multiple of ten (10, 100, 1000, etc.), move the decimal point as many places to the left as there are zeroes in the divisor.

EXAMPLE: When dividing .2 by 1<u>00</u>, move the decimal point one place <u>to the left</u> for each of the zeros in the divisor (the number you are dividing into the other number). There are two zeros; therefore, you move the decimal two places to the left.

$$.2 \div 100 = 0.00.2 = 0.002$$

EXAMPLES:

(1) $5 \div 1\underline{0}$ =   .5   (4) $1.8 \div 1\underline{0}$ = .18

(2) $5 \div 1\underline{00}$ = .05   (5) $1.8 \div 1\underline{00}$ = .018

(3) $5 \div 1\underline{000}$ = .005   (6) $1.8 \div 1\underline{000}$ = .0018

e.   Did you remember how to round off numbers? Whenever instructed to round off to a specific decimal place, solve the problem to one more place and round off.

EXAMPLE: (round to 2d decimal place)

$$52.5 - 5.2 = 10.096 = 10.10$$

1-32. PRACTICE 1-6

Round the following numbers to two decimal places.

a.   10.333   =

b.   11.625   =

c.   12.611   =

d.   3.237   =

e.   2.621   =

f.   0.396   =

Divide the following decimals; round off to second decimal place.

g.   100.25 ÷ 50.5 =

h.   40.5 ÷   5.5 =

i.   82.5 ÷ 0.02   =

j.   44 ÷ 2.2 =

k. 56 ÷ 4.3 =

l. 43.6 ÷ 5   =

m. 3.6 ÷ 3   =

Work the following problems:

n.   6.2. ÷ 1 00   =

o. 20 ÷ 10   =

p. 4.3 ÷ 1000 =

q. .08 ÷ 100   =

r. .7 ÷ 10   =

s. 12.324 ÷ 100 =

t. 65 ÷ 1000 =

u. .025 ÷ 10   =

v. 1.34 ÷ 1000 =

w. 65.0 ÷ 100   =

1-33. ANSWERS TO PRACTICE 1-6

a. 10.33   b. 11.63

c. 12.61   d. 3.24

e. 2.62   f. 0.40

g.
```
           1.985
50.5.)100.2.500
     ↶      ↷
        50 5
        49 7 5
        45 4 5
         4 3 00
         4 0 40
           2 600
           2 525
             75
```

h.
```
        7.363 = 7.36
5.5.)40.5.000
   ↶      ↷
      38 5
       2 0 0
       1 6 5
       3 50
       3 30
        200
        165
         35
```

i.
```
        41 25.
0.02.)82.50.
    ↶     ↷
      8
      02
       2
       0 5
         4
         10
         10
```

j.
```
       2 0.
2.2.)44.0.
   ↶     ↷
     44
      0 0
      0 0
```

k.
```
          1 3.023 = 13.02
4.3.)56.0.000
   ↶       ↷
       43
       13 0
       12 9
          1 0
            0
          1 00
           86
          140
          129
           11
```

l.
```
      8.72
5)43.60
   40
   ─
    3 6
    3 5
     10
     10
      0
```

m.
```
      1.2
3)3.6
   3
   0 6
     6
     0
```

n.   .062   o. 2

p.   .0043   q. .0008

r.   .07   s. .12324

t.   .065   u. .0025

v.   .00134   w. .65

1-34. MULTIPLYING DECIMALS

Decimals can be multiplied by whole numbers and decimals by:

a.   Multiplying in the usual manner.

b.   Pointing off the proper number of decimal places.

   5.25 x 5 = 26.25

$$\begin{array}{r} 5.25 \\ \underline{\times\ \ \ 5} \\ 26.25 \end{array}$$

(Two decimal places pointed off for the two places in 5.25)

EXAMPLE: 5.25 x 5.5 = 28.875

$$\begin{array}{r} 5.25 \\ \underline{\times\ 5.5} \\ 2625 \\ \underline{2625} \\ 28.875 \end{array}$$

(Three decimal places pointed off for the three places in 5.25 and 5.5)

How many places would be pointed off in 3.24 x 3.56?

     You are correct if you answered "four."

1-35. CHANGING DECIMALS TO FRACTIONS

Decimals can be changed to fractions by:

a.   Removing the decimal point.

b.   Placing the appropriate denominator under the number.

c.   Reducing to lowest terms.

EXAMPLE: Change 0.05 to a fraction.

05 (decimal removed)

$$\frac{05}{100} \text{ (note denominator)} = \frac{1}{20}$$

1-36.   CHANGING FRACTIONS TO DECIMALS

Fractions can be changed to decimals by dividing the numerator of the fraction by the denominator of the fraction.

EXAMPLE: Change $\frac{1}{2}$ to a decimal.

1 ÷ 2 (numerator ÷ denominator)

$$2)\overline{1.0}^{.5}$$

$$\frac{1}{2} = 0.5$$

1-37. PRACTICE 1-7

Multiply the following:

a.   3.33 x 2.02 =

b.   40.1 x 4.01 =

c.   2.55 x 20.5 =

d.   5.25 x 3.5 =

e.   7.05 x 7.5 =

f.   85.05 x 3.05 =

Change the following to fractions:

g.   0.35 =

h.　0.3 =

i.　0.04 =

j.　0.005 =

k.　0.75 =

l.　0.55 =

Change the following to decimals:

m.　$\dfrac{1}{4}$ =

n.　$\dfrac{1}{6}$ =

o.　$\dfrac{7}{8}$ =

p.　$\dfrac{5}{7}$ =

q.　$\dfrac{2}{5}$ =

r.　$\dfrac{1}{5}$ =

1-38.　ANSWERS TO PRACTICE 1-7

a.　3.33
　x　2.02
　　　666
　　6660
　　6.7266

b.　40.1
　　x 4.01
　　　401
　160 40
　160.801

c. 2.55
x 20.5
1 275
51 00
52.275

d. 5.25
x 3.5
2 625
15 75
18.375

e. 7.05
x 7.5
3 525
49 35
52.875

f. 85.05
x 3.05
4 2525
255 150
259.4025

g. $\dfrac{35}{100} = \dfrac{7}{20}$ (35 ÷ 5 = 7)
   (100 ÷ 5 = 20)

h. $\dfrac{3}{10}$

i. $\dfrac{4}{100} = \dfrac{1}{25}$ (4 ÷ 4 = 1)
   (100 ÷ 4 = 25)

j. $\dfrac{5}{1000} = \dfrac{1}{200}$ (5 ÷ 5 = 1)
   (1000 ÷ 5 = 200)

k. $\dfrac{75}{100} = \dfrac{3}{4}$ (75 ÷ 25 = 3)
   (100 ÷ 25 = 4)

l. $\dfrac{55}{100} = \dfrac{11}{20}$ (55 ÷ 5 = 11)
   (100 ÷ 5 = 20)

m.
```
      .25
   4)1.00
      8
      20
      20
```

n. $\underline{.166} = 0.17$
   6)1.000
       $\underline{6}$
       40
       $\underline{36}$
       40
       $\underline{36}$
        4

o. $\underline{.875} = 0.88$
   8)7.000
      6 4
      $\overline{60}$
      $\underline{56}$
      40
      $\underline{40}$

p. $\underline{.714} = 0.71$
   7)5.000
      4 9
      $\overline{10}$
       $\underline{7}$
       30
       $\underline{28}$
        2

q. $\underline{.4}$
   5)2.0
     $\underline{2\,0}$

r. $\underline{.2}$
   5)1.0
     $\underline{1\,0}$

Section IV. PERCENTAGES

NOTE: The final exam will not include information from Section IV. This is for your information only.

1-39. DEFINITION

Percentage means parts in 100. The term "percent" is usually indicated by the symbol "%."

1-40. CHANGING PERCENTAGES TO FRACTIONS

When the percentage is a whole number, mixed number, or fraction, it can be changed to a fraction by:

a.   Omitting the percent sign.

b.   Writing the whole number, mixed number, or fraction as the numerator.

c.   Writing 100 as the denominator.

d.   Reducing the resulting fraction to lowest terms.

EXAMPLES: Change 5% to a fraction.

$$5\% = \frac{5}{100} = \frac{1}{20}$$

Change $\frac{1}{2}$% to a fraction.

$$\frac{1}{2}\% = \frac{\frac{1}{2}}{100} = \frac{1}{2} \div \frac{100}{1} = \frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$$

Change $5\frac{1}{2}$% to a fraction.

$$5\frac{1}{2}\% = \frac{5\frac{1}{2}}{100} = \frac{11}{2} \cdot \frac{100}{1} = \frac{11}{2} \times \frac{1}{100} = \frac{11}{200}$$

1-41. CHANGING FRACTIONS TO PERCENTAGES

Fractions can be changed to percentages by:

a.   Multiplying by 100.

b.   Adding the percent symbol.

EXAMPLE: Change $\frac{1}{2}$ to a percent.

$$\frac{1}{2} \times \frac{100}{1} = \frac{100}{2} \times 50\%$$

1-42. CHANGING PERCENTAGES TO DECIMALS

Percentages can also be changed to decimals by removing the percent sign; then:

a.   If the percentage is a whole number, divide by 100 (this can be done quickly by moving the decimal point two places to the left).

EXAMPLE: Change 10% to a decimal.

$$10\% \rightarrow 10. \rightarrow 0.1$$

b.   If the percentage is written as a fraction or mixed number, change to a decimal, and then move the decimal point two places to the left.

EXAMPLE: Change $\frac{1}{5}$% to a decimal.

$$\frac{1}{5}\% \rightarrow \frac{1}{5} \rightarrow 1 \div 5 = 0.2 \rightarrow 0.002$$

EXAMPLE: Change $3\frac{1}{2}$% to a decimal.

$$3\frac{1}{2}\% \rightarrow 3\frac{1}{2} = 7 \div 2 = 3.5 \rightarrow 0.035$$

1-43. CHANGING DECIMALS TO PERCENTAGES

A decimal can be changed to a percentage by:

a.   Multiplying by 100 (this can be done by moving the decimal point two places to the right).

b.   Adding a percent sign (%).

EXAMPLE: Change 0.5 to a percentage.

$$0.5 \rightarrow 50. \rightarrow 50\%$$

1-44. PRACTICE 1-8

a.   Change the following percentages to fractions:

(1)   6 %

(2) $\frac{1}{8}$ %

(3) $3\frac{1}{2}$ %

(4) $\frac{4}{5}$ %

(5) $12\frac{1}{2}\%$

(6)   30%

b. Change the following fractions to percentages:

(1) $\frac{3}{5}$

(2) $\frac{1}{8}$

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

(4) $\frac{1}{100}$

(5) $\frac{1}{50}$

(6) $\frac{1}{25}$

c. Change the following percentages to decimals:

(1) $\frac{3}{4}\%$

(2)   50 %

(3)   40 %

(4) $2\frac{1}{2}\%$

(5)   6 %

(6) $6\frac{1}{5}\%$

d. Change the following decimals to percentages:

(1)   0.25

(2)   0.125

(3)   3.5

(4)   7.5

(5)   0.75

(6)   0.4

1-45. ANSWERS TO PRACTICE 1-8

a. (1) $\dfrac{6}{100} = \dfrac{3}{50}$ $\begin{array}{l}(6 \div 2 = 3)\\(100 \div 2 = 50)\end{array}$

(2) $\dfrac{1/8}{100} = \dfrac{1}{8} \div \dfrac{100}{1} = \dfrac{1}{8} \times \dfrac{1}{100} = \dfrac{1}{800}$

(3) $\dfrac{3\frac{1}{2}}{100} = \dfrac{7}{2} \div \dfrac{100}{1} = \dfrac{7}{2} \times \dfrac{1}{100} = \dfrac{7}{200}$

(4) $\dfrac{\frac{4}{5}}{100} = \dfrac{4}{5} \div \dfrac{100}{1} = \dfrac{4}{5} \times \dfrac{1}{100} = \dfrac{4}{500} = \dfrac{1}{125}$ or $\dfrac{4}{5} \times \dfrac{1}{\overset{\cancel{100}}{\underset{25}{}}} = \dfrac{1}{125}$

(5) $\dfrac{12\frac{1}{2}}{100} = \dfrac{25}{2} \div \dfrac{100}{1} = \dfrac{25}{2} \times \dfrac{1}{100} = \dfrac{25}{200} = \dfrac{1}{8}$ or $\dfrac{25}{2} \times \dfrac{1}{\underset{4}{\cancel{100}}} = \dfrac{1}{8}$

(6) $\dfrac{30}{100} = \dfrac{3}{10}$

b. (1) $\dfrac{3}{5} \times \dfrac{100}{1} = \dfrac{300}{5} \rightarrow 60\%$ (or $\dfrac{3}{\underset{1}{\cancel{5}}} \times \dfrac{\overset{20}{\cancel{100}}}{1} = 60$)

(2) $\dfrac{1}{8} \times \dfrac{100}{1} = \dfrac{100}{8} \rightarrow 12\ 1/2\%$ or 12.5%) (or $\times \dfrac{1}{\underset{2}{\cancel{8}}}\ \dfrac{\overset{25}{\cancel{100}}}{1} = \dfrac{25}{2} = 12.5$)

(3) $\frac{1}{4} \times \frac{100}{1} = \frac{100}{4} \rightarrow 25\%$ (or $\frac{1}{\underset{1}{\cancel{4}}} \times \frac{\overset{25}{\cancel{100}}}{1} = 25$)

(4) $\frac{1}{100} \times \frac{100}{1} = \frac{100}{100} \rightarrow 1\%$ (or $\frac{1}{\underset{1}{\cancel{100}}} \times \frac{\overset{1}{\cancel{100}}}{1} = 1$)

(5) $\frac{1}{50} \times \frac{100}{1} = \frac{100}{50} \rightarrow 2\%$ or ($\frac{1}{\underset{1}{\cancel{50}}} \times \frac{\overset{2}{\cancel{100}}}{1} = 2$)

(6) $\frac{1}{25} \times \frac{100}{1} = \frac{100}{25} \rightarrow 4\%$ (or $\frac{1}{\underset{1}{\cancel{25}}} \times \frac{\overset{4}{\cancel{100}}}{1} = 4$)

c. (1) $\overset{\ \ .75}{4)\overline{3.00}} \rightarrow 0.0075$
           $\underline{2\ 8}$
            20
           $\underline{20}$
             0

(2) 0.5

(3) 0.4

(4) $2\frac{1}{2}\% \rightarrow \frac{5}{2} = \overset{\ \ 2.5}{2)\overline{5.0}} \rightarrow 0.025$
                       $\underline{4}$
                      $1\ 0$
                     $\underline{1\ 0}$
                        0

(5) 0.06

(6) $6\frac{1}{5}\% \rightarrow \frac{31}{5} = \overset{\ \ 6.2}{5)\overline{31.0}} \rightarrow 0.062$
                      $\underline{30}$
                      $1\ 0$
                      $\underline{1\ 0}$
                        0

d. (1) 25%

(2) 12.5% or $12\frac{1}{2}\%$

(3)   350%

(4)   750%

(5)   75%

(6)   40%

Section V. RATIO AND PROPORTION

1-46. DEFINITION--RATIO

A ratio is a way of expressing a fractional part of a whole number. In a ratio, the numerator of the fraction is written in front of the denominator instead of over it.

EXAMPLE: In a ratio, the fraction $\frac{1}{2}$ would be written 1:2 or 1-2.
The symbol ":" or "-" is placed between the numbers of the ratio.

1-47. CHANGING A RATIO TO A PERCENTAGE OR DECIMAL

A ratio is changed to a percentage or decimal in the same way a fraction is changed to a percentage or decimal.

EXAMPLE: Change 1:50 to a percentage.

$$1:50 \rightarrow \frac{1}{50} \times \frac{100}{1} \rightarrow 2\%$$

EXAMPLE: Change 1:50 to a decimal.

$$1:50 = \frac{1}{50} = 1 \div 50 = 0.02$$

1-48. PRACTICE 1-9

a. Write the following as ratios:

(1) $\frac{1}{4}$ =

(2) $\frac{1}{100}$ =

(3) $\frac{1}{10}$ =

(4) $\dfrac{1}{1000}$ =

(5) $\dfrac{1}{50}$ =

(6) $\dfrac{1}{75}$ =

b. Change the following ratios to both decimals and percentages:

Ratio		Decimal	Percent
(1)	1:3	_____	_____
(2)	1:1000	_____	_____
(3)	1:150	_____	_____

1-49. ANSWERS TO PRACTICE 1-9

a. (1)   1:4

   (2)   1:100

   (3)   1:10

   (4)   1:1000

   (5)   1:50

   (6)   1:75

b. (1)   0.33 $33\dfrac{1}{3}\%$

   (2)   0.001 $\dfrac{1}{10}\%$

   (3)   0.00666 or $\dfrac{2}{3}\%$
          0.0067

1-50. CHANGING PERCENTAGES TO RATIOS

Changing a percentage to a ratio is the same as changing a percentage to a fraction.

EXAMPLE: Change 50% to a ratio.

$$50\% = .50 = \frac{50}{100} = \frac{1}{2} = 1{:}2$$

1-51. CHANGING DECIMALS TO RATIOS

This is calculated in the same manner as changing a decimal to a fraction.

EXAMPLE: Change 0.5 to a ratio.

$$0.5 = \frac{5}{10} = \frac{1}{2} = 1{:}2$$

1-52. PRACTICE 1-10

a. Change the following percentages to ratios:

(1) 10% _____

(2) $\frac{1}{2}$% _____

(3) 80% _____

(4) 40% _____

(5) $\frac{1}{4}$% _____

(6) 1% _____

b. Change the following decimals to ratios:

(1) 0.2 _____

(2) 0.025 _____

(3) 0.05 _____

(4) 0.001 _____

(5) 0.075 _____

(6) 0.1 _____

1-53. ANSWERS TO PRACTICE 1-10

a. (1) $.10 = \dfrac{10}{100} = \dfrac{1}{10} = 1:10$

   (2) $\dfrac{\frac{1}{2}}{100} = \dfrac{1}{2} \div \dfrac{100}{1} = \dfrac{1}{2} \times \dfrac{1}{100} = \dfrac{1}{200} = 1:200$

   (3) $.80 = \dfrac{80}{100} = \dfrac{8}{10} = \dfrac{4}{5} = 4:5$

   (4) $.40 = \dfrac{40}{100} = \dfrac{4}{10} = \dfrac{2}{5} = 2:5$

   (5) $\dfrac{1/4}{100} = \dfrac{1}{4} \div \dfrac{100}{1} = \dfrac{1}{4} \times \dfrac{1}{100} = \dfrac{1}{400} = 1:400$

   (6) $.01 = \dfrac{1}{100} = 1:100$

b. (1) $\dfrac{2}{10} = \dfrac{1}{5} = 1:5$

   (2) $\dfrac{25}{1000} = \dfrac{1}{40} = 1:40$

   (3) $\dfrac{5}{100} = \dfrac{1}{20} = 1:20$

   (4) $\dfrac{1}{1000} = 1:1000$

   (5) $\dfrac{75}{1000} = \dfrac{3}{40} = 3:40$

   (6) $\dfrac{1}{10} = 1:10$

1-54. DEFINITION--PROPORTION

An equation that tells us that one ratio is equal to another ratio is called a proportion.

EXAMPLE:

A baseball team wins 15 games out of 30 games played. If the team continues to win at the same rate, how many games will it win out of 40 games played?

a. Let N = number of games the team will win in 40 games played.

b. The ratio of games won to games already played is 15/30. Since the ratio of games won to games played is to remain the same, we may write this ratio as N/40. These ratios may also be written as 15:30 and N:40.

c. We may now write the equation 15/30 = N/40. This is our proportion.

1-55. PROPERTY OF PROPORTIONS

Proportions have a very useful property. Consider the proportion: $\frac{1}{3} = \frac{2}{6}$ or 1:3 = 2:6.

a. The two inside terms (3 and 2) are called the "means" of the proportion, and the two outside terms (1 and 6) are called the "extremes" of the proportion.

b. Notice that if we multiply the two means, we obtain 3 x 2 = 6. Also, if we multiply the two extremes, we obtain 1 x 6 = 6. This illustrates the following property of proportions:

In a proportion, the product of the means is equal to the product of the extremes.

EXAMPLE: The ratio of alcohol to water in a certain type of antifreeze is 3:4. If a tank contains 24 quarts of alcohol, how many quarts of water must be added to make the antifreeze mixture?

Let X = the number of quarts needed.

$$\frac{alcohol}{water} \qquad \frac{3}{4} = \frac{24}{X}$$

Now, use the property of proportions to find "X."

$$3:4 = 24:X$$
$$3X = 4 \times 24$$
$$3X = 96$$
$$\frac{1}{3}(3X) = \frac{1}{3}(96) \text{ or } \frac{3X}{3} = \frac{96}{3}$$
$$X = 32 \text{ quarts of water}$$

or

cross multiply

$$\frac{3}{4} = \frac{24}{X}$$

Multiply the numerator of the first ratio by the denominator of the second ratio. Then multiply the denominator of the first ratio by the numerator of the second ratio.

$$3X = 4 \times 24$$
$$3X = 96$$
$$X = 32 \text{ quarts of water}$$

SECOND EXAMPLE:

If three ties cost $12.57, what is the cost of five ties at the same rate?

Let y = the cost of five ties.

$$3:12.57 = 5:y$$

$$\frac{3}{12.57} = \frac{5}{y}$$

$$3y = 5 \times 12.57 = 62.85$$

$$\frac{1}{3}(3y) = \frac{1}{3}(62.85)$$

$$y = \$20.95$$

1-56. PRACTICE 1-11

a. $4:3 = 32:W$ W = _____

b. John earned $150 one week and spent $120. What is the ratio of the amount John saved to the amount John spent?

_____

c. The ratio of a father's age to his son's age is 9:2. If the son's age is 12 years, what is the age of the father (in years)?

_____

d. If three shirts cost $23, what is the cost of a dozen shirts at the same rate?

_____

e. A gallon of paint covers 240 square feet of surface. If a living room contains 906 square feet of paintable surface and a kitchen contains 334 square feet of surface, what is the number of gallons of paint needed for the living room and kitchen?

_____

1-57. ANSWERS TO PRACTICE 1-11

a. 4:3 = 32:W

4W = 3 x 32

4W = 96

W = 24

b. 30:120 = 1:4

c. 2:9 = 12:x

2X = 9 x 12

2X = 108

X = 54

d. 3:23 = 12:X

3X = 23 x 12

3X = 276

X = 92

e.   1:240 = X:1240   (1240 is the sum of 906 and 334)

1 x 1240 = 240X

1240 = 240X

X = 5 $\frac{1}{6}$

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: Answer the following items by writing the answer in the space provided.

     After you have completed all of these items, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1.   2975
     x 36

2. $\overline{}$
   50)78340

3.   376
    -107

4.   564
    x 231

5.   4791
   +3208

6.   4638
    -3135

7.   6)726

8.   4372
   +6629

9.   285
   -193

10. 75)2625

11. Change to lowest terms: $\dfrac{16}{20}$

12. Change to mixed or whole number: $\dfrac{30}{5}$

13. Change to mixed or whole number: $\dfrac{16}{15}$

14. Change to improper fraction: $10\dfrac{1}{2}$

15. $8 \times \dfrac{2}{3} =$

16. $4 \times \dfrac{3}{8} =$

17. $\dfrac{3}{8} \times \dfrac{4}{5}$ =

18. $2 \times 1\dfrac{1}{2}$ =

19. $10\dfrac{1}{2} \times 3\dfrac{1}{4}$ =

20. $10 \div 1\dfrac{1}{2}$ =

21. $\dfrac{2}{3} \div \dfrac{3}{4}$ =

22. $100.25 \div 50.5$ =

23. $30.3 \div 3.3$ =

24. $65 \div 0.32$ =

25. $5.63 \div 15$ = _____

26. 140×2.5 = _____

27. 7.125×0.25 = _____

28. Change 0.5 to a fraction _____

29. Change 0.04 to a fraction _____

30. Change $\dfrac{1}{3}$ to a decimal _____

31. Change 0.5% to a decimal _____

32. Change 0.8 to a percent _____

33. Change 5.25 to a percent _____

34. Change 75% to a fraction _____

35. Change $7\dfrac{1}{2}$% to a decimal _____

36. Change 15 $\frac{1}{2}$% to a fraction   _____

37. Change $\frac{4}{5}$ to a percent   _____

38. Change $\frac{3}{5}$% to a decimal   _____

39. Change 4.5 to a percent   _____

40. Change $\frac{1}{4}$% to a ratio   _____

41. Change 1**:**3 to a percent   _____

42. Change 1**:**2000 to a percent   _____

43. Change 1**:**2000 to a decimal   _____

44. Change 0.002 to a ratio   _____

45. Change 20% to a ratio   _____

46. Change 0.75 to a ratio   _____

47. Change 1:4 to a decimal   _____

48. Mr. Ash finds that he spends $47.50 for gas for each 1,000 miles that he drives his car. One month he drives his car 1,800 miles. The amount he spent on gas during that month is _____.

49. On a map, the scale is 1" to 80 miles. The actual distance between two cities is 200 miles. The distance between the cities, on the map, is _____.

50. A 25-acre field yields 375 bushels of wheat. How many acres should be planted to yield 525 bushels of wheat? _____

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1.   2975
    x 36
  17850
   8925
 107100

   (para 1-10)

2.   1566.8
    50)78340.0
      50
     283
     250
     334
     300
      340
      300
       400
       400 (para 1-11)

3.   376
   -107
   269

   (para 1-3)

4.   564
   x 231
   564
  1692
 1128
 130284 (para 1-10)

5. 4791
 + 3208
  7999

  (para 1-2)

6.   4638
   -3135
   1503

   (para 1-3)

7.   121
   6)726
    6
    12
    12
    06
     6 (para 1-11)

8.   4372
   +6629
   11001

   (para 1-2)

9.   285
  -193
   92

  (para 1-3)

10.   35
    75)2625
     225
     375
     375 (para 1-11)

11. $\dfrac{16}{20} = \dfrac{4}{5}$

  (para 1-17)

12. $\dfrac{30}{5} = 6$

  (para 1-18)

13. $\frac{16}{15} = 1\frac{1}{15}$

(para 1-18)

14. $10\frac{1}{2} = \frac{21}{2}$

(para 1-21)

15. $\frac{8}{1} \times \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3}$

(para 1-24)

16. $\frac{4}{1} \times \frac{3}{8} = \frac{12}{8} = 1\frac{1}{2}$

(para 1-24)

17. $\frac{3}{8} \times \frac{4}{5} = \frac{12}{40} = \frac{3}{10}$

(para 1-23)

18. $2 \times 1\frac{1}{2} = \frac{2}{1} \times \frac{3}{2} = \frac{6}{2} = 3$

(para 1-24)

19. $10\frac{1}{2} \times 3\frac{1}{4} = \frac{21}{2} \times \frac{13}{4} = \frac{273}{8} = 34\frac{1}{8}$

(para 1-25)

20. $10 \div 1\frac{1}{2} = \frac{10}{1} \times \frac{2}{3} = \frac{20}{3} = 6\frac{2}{3}$

(para 1-26)

21. $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$

(para 1-26)

22.
```
        1.985  = 1.99
50.5.)100.2.500
      ↻      ↻
     50 5
     49 7 5
     45 4 5
      4 3 00
      4 0 40
        2 600
        2 525
          75  (para 1-31)
```

23.
```
        9.181 = 9.18
3.3.)30.3.000
    ↻    ↻
    29 7
     6 0
     3 3
     2 70
     2 64
       60
       33
       27
```
(para 1-31)

24.
```
        2 03.125 = 203.13
0.32.)65.00.000
     ↻  64 ↻
        1 0
         0
        1 00
         96
         40
         32
         80
         64
        160
        160  (para 1-31)
```

25.

```
    .375 = 0.38
15)5.630
   4 5
   1 13
   1 05
     80
     75
      5
```

(para 1-31)

26.

```
    140
    2.5
   ____
    700
   280
   _____
   350.0
```

(para 1-34)

27.

```
 7.125
  0.25
 _____
 35625
 14250
 _____
 1.78125 = 1.78
```

(para 1-34)

28. $0.5 = \dfrac{5}{10} = \dfrac{1}{2}$

(para 1-35)

29. $0.04 = \dfrac{4}{100} = \dfrac{1}{25}$

(para 1-35)

30. $\dfrac{1}{3} = 1 \div 3 = .33$

(para 1-36)

31. 0.5% = 0.005   (para 1-42)

32. 0.8 = 80%   (para 1-43)

33. 5.25 = 525%   (para 1-43)

34. $75\% = \dfrac{75}{100} = \dfrac{3}{4}$ (para 1-40)

35. $7\dfrac{1}{2}\% = \dfrac{15}{2} = 7.5 = .075$ (para 1-42)

36. $15\dfrac{1}{2}\% = \dfrac{15\dfrac{1}{2}}{100} = \dfrac{31}{2} \div \dfrac{100}{1} = \dfrac{31}{2} \times \dfrac{1}{100} = \dfrac{31}{200}$ (para 1-40)

37. $\dfrac{4}{5} = 4 \div 5 = .8 = 80\%$ (para 1-41)

38. $\dfrac{3}{5} = 3 \div 5 = .6 = 0.006$ (para 1-42)

39. 4.5 = 450%

  (para 1-41)

40. $\dfrac{1}{4}\% = \dfrac{1}{\frac{4}{100}} = \dfrac{1}{4} \div \dfrac{100}{1} = \dfrac{1}{4} \times \dfrac{1}{100} = \dfrac{1}{400} = 1:400$

  (para 1-50)

41. $1:3 = \dfrac{1}{3} \times \dfrac{100}{1} = \dfrac{100}{3} = 33\dfrac{1}{3}\%$ (para 1-47)

42. $1:2000 = \dfrac{1}{2000} \times \dfrac{100}{1} = \dfrac{100}{2000} = \dfrac{1}{20}\%$ (para 1-47)

43. $1:2000 = \dfrac{1}{2000} = 1 \div 2000 = 0.0005$ (para 1-47)

44. $0.002 = \dfrac{2}{1000} = \dfrac{1}{500} = 1:500$ (para 1-51)

45. $20\% = .20 = \dfrac{20}{100} = \dfrac{1}{5} = 1:5$ (para 1-51)

46. $0.75 = \dfrac{75}{100} = \dfrac{3}{4} = 3:4$ (para 1-51)

47. $1:4 = \dfrac{1}{4} = 1 \div 4 = 0.25$ (para 1-47)

48. 47.50:1000 = X:1800

  1000X = 85,500

  X = $85.50   (para 1-55)

49. 1:80 = X:200

  80X = 200

  X = $2\dfrac{1}{2}$" or 2.5"   (para 1-55)

50. 25:375 = X = 525

$375X = 13,125$

$X = 35$ (para 1-55)

End of Lesson 1