OBJECTIVE SHEET

FUNDAMENTAL MATH

4

INTRODUCTION

Being able to calculate area, volume, and proportions is a valuable skill in the concrete industry. Calculating area allows you to estimate materials. Volume measurements help you to estimate concrete for walls, steps, and floor slabs, for example. Ratios and proportions are required for mixing ingredients properly and for understanding relationships such as heat loss and load-bearing capacities. Area, volume, and proportion are key concepts in understanding how concrete reacts under certain conditions. They are also skills needed to perform specific tests on concrete. Developing your math skills in these areas will help you succeed on the job.

FOCUS ASSIGNMENTS

FOCUS ASSIGNMENTS

1. Consider a project you worked on recently.
2. Make a list of at least five examples in which fundamental math skills were used. Include both planning and executing the project.

Writing

Critical Thinking

UNIT OBJECTIVE

After completing this unit, you will show the following competencies by mastering the activities on the Assignment Sheets and by scoring at least 85% on the Written Test.

SPECIFIC OBJECTIVES

1. Match terms associated with basic math to their correct definitions.
2. Match symbols used in math problems to their correct names.
3. Label the place values of a whole number.
4. Add whole numbers.
5. Subtract whole numbers.
6. Multiply whole numbers.
7. Divide whole numbers.

8. Distinguish among types of fractions.
9. Reduce fractions to lowest terms.
10. Convert mixed numbers to improper fractions.
11. Convert improper fractions to mixed numbers.
12. Add fractions.
13. Subtract fractions.
14. Multiply fractions.
15. Label the place values of a decimal number.
16. Add decimal numbers.
17. Subtract decimal numbers.
18. Multiply decimal numbers.
19. Divide decimal numbers.
20. Convert decimal fractions to common fractions.
21. Convert common fractions to decimal numbers and percentages.
22. Identify decimal and fractional equivalents.
23. Convert percentages to fractions and decimal numbers.
24. Solve percentage problems.
25. Match terms used in geometry to their correct descriptions.
26. Match types of geometric figures to their correct descriptions.
27. Match units of measure to their correct equivalents.
28. Calculate the area of geometric figures.
29. Calculate volume of solid figures.
30. Estimate cubic yards.
31. Solve basic ratio and proportion problems.
32. Add whole numbers. (Assignment Sheet 1)
33. Subtract whole numbers. (Assignment Sheet 2)
34. Multiply whole numbers. (Assignment Sheet 3)

35. Divide whole numbers. (Assignment Sheet 4)
36. Distinguish among types of fractions. (Assignment Sheet 5)
37. Reduce fractions to lowest terms. (Assignment Sheet 6)
38. Convert mixed numbers to improper fractions. (Assignment Sheet 7)
39. Convert improper fractions to mixed numbers. (Assignment Sheet 8)
40. Add fractions. (Assignment Sheet 9)
41. Subtract fractions. (Assignment Sheet 10)
42. Multiply fractions. (Assignment Sheet 11)
43. Add decimal numbers. (Assignment Sheet 12)
44. Subtract decimal numbers. (Assignment Sheet 13)
45. Multiply decimal numbers. (Assignment Sheet 14)
46. Divide decimal numbers. (Assignment Sheet 15)
47. Convert common fractions to decimal numbers and percentages. (Assignment Sheet 16)
48. Solve percentage problems. (Assignment Sheet 17)
49. Calculate the area of geometric figures. (Assignment Sheet 18)
50. Calculate volume of solid figures. (Assignment Sheet 19)
51. Estimate cubic yards. (Assignment Sheet 20)
52. Solve basic ratio and proportion problems. (Assignment Sheet 21)

OBJECTIVE 1

Match terms associated with basic math to their correct definitions.

Optional Activities/Resources in Instructor's Guide

- **addition** — process of totalling two or more numbers to find another number called a sum

  EXAMPLE: $3 + 5 + 9 = 17$

- **calculate** — to perform a mathematical process
- **caret** — inverted "v" symbol used to indicate where something is to be inserted
- **decimal** — fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

  EXAMPLES:

  $$0.1 = \frac{1}{10}$$

  $$0.06 = \frac{6}{100}$$

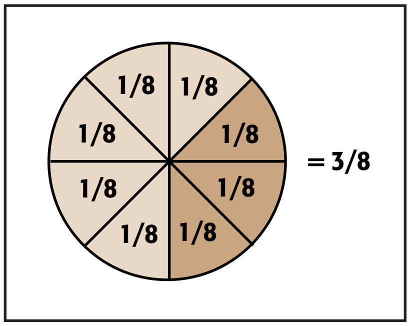
  $$0.003 = \frac{3}{1000}$$

- **digit** — any one of the ten symbols, 0 to 9, by which all numbers can be expressed
- **division** — opposite (inverse) operation of multiplication

  EXAMPLE: $16 \div 2 = 8$ as compared to $8 \times 2 = 16$

- **fraction** — part of a whole; represents one or more equal parts of a unit (Figure 1)

FIGURE 1



- **modular** — pertaining to nominal units based on a 4-inch modular

- **multiplication** — abbreviated process of adding a number to itself a specified number of times

  EXAMPLE: 6 x 3 = 18 as compared to 6 + 6+ 6 = 18

- **nominal size**— theoretical size that may vary from the actual

  EXAMPLE: a 2 x 4 stud is actually 1½ inches by 3½ inches

- **percent** — one part of a hundred; calculated on the basis of a whole divided into one hundred parts

- **problem** — mathematical proportion

- **proportional** — being relatively equal in size and quantity

  EXAMPLE: 1:1:3 = 0.5:0.5:1.5

- **ratio** — relationship in quantity, amount, or size between two or more things

- **subtraction** — opposite (inverse) operation of addition

  EXAMPLE: 8 - 4 = 4 as compared to 4 + 4 = 8

- **whole number (integer)** — any of the natural numbers, both positive and negative, that represent a complete item

  EXAMPLE: 25 is a whole number as compared to ¾, a fraction or part of a whole

OBJECTIVE 2

Match symbols used in math problems to their correct names.

Optional Activities/
Resources in Instructor's
Guide

FIGURE 2

Name of Symbol	Symbol
Plus sign (addition)	+
Minus sign (subtraction)	-
Times sign (multiplicaton)	x
Division sign	÷
Division frame	)‾‾‾
Equal sign	=
Decimal point	.
Percent symbol	%
Ratio symbol	:
Pi sign	Π

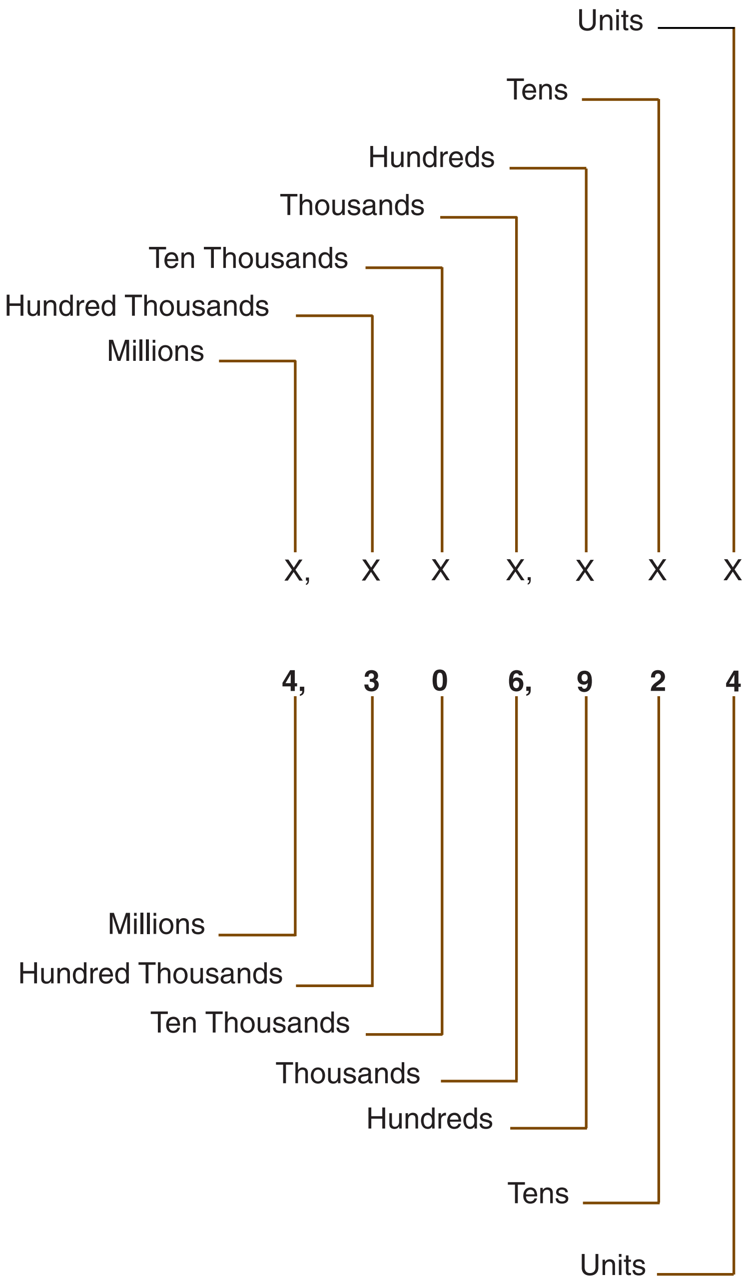
OBJECTIVE 3

Optional Activities/
Resources in Instructor's
Guide

Label the place values of a whole number.

✔ **NOTE:** The position of a digit in a number shows how much that digit is worth. These positions are called place values.

EXAMPLE:



✔ **NOTE:** The number in this example is four million, three hundred six thousand, nine hundred twenty-four.

OBJECTIVE 4

Optional Activities/ Resources in Instructor's Guide

Add whole numbers.

1. Set up the problem by writing units under units, tens under tens, and so on.

   EXAMPLE: Add the whole numbers 1632, 17, and 550

$$\begin{array}{r} 1632 \\ 17 \\ \underline{+\ 550} \end{array}$$

2. Add each column separately, beginning at the top of the units column.

EXAMPLE:

$$\begin{array}{r} 1632 \\ 17 \\ \underline{+\ 550} \\ 9 \end{array} \qquad \begin{array}{r} 1632 \\ 17 \\ \underline{+\ 550} \\ 99 \end{array}$$

3. If the sum of any column is two or more digits, write the units digits in your answer and carry the remaining digit(s) to the top of the next column to the left.

EXAMPLE:

$$\begin{array}{r} \\ 1632 \\ 17 \\ \underline{+\ 550} \\ \text{Write unit digit.} \rightarrow \quad 199 \end{array} \qquad \begin{array}{rl} 1 & \leftarrow \text{Carry remaining digit.} \\ 1632 & \\ 17 & \\ \underline{+\ 550} & \\ 199 & \end{array}$$

4. Add any carried digit(s) above the column with that column.

EXAMPLE:

$$\begin{array}{rl} 1 & \leftarrow \text{Carried digit.} \\ 1632 & \\ 17 & \\ \underline{+\ 550} & \\ 2199 & \end{array}$$

OBJECTIVE 5

Optional Activities/ Resources in Instructor's Guide

Subtract whole numbers.

1. Set up the problem by writing units under units, tens under tens, and so on.

   ✔ **NOTE:** The top number in the problem [original number] is almost always larger than the bottom number [subtracted number].

   EXAMPLE: Subtract 91 from 123

$$\begin{array}{rl} 123 & \text{Original Number} \\ \underline{-\ 91} & \text{Subtracted Number} \end{array}$$

2. Subtract each column separately, beginning at the bottom of the units column.

EXAMPLE:

$$\begin{array}{r} 123 \\ \underline{-\ 91}\uparrow \\ 2 \end{array}$$

3. If a digit in the number being subtracted is larger than the digit above it, "borrow" 1 from the top digit in the next column to the left, decreasing that digit by one and increasing the digit being subtracted by ten.

EXAMPLE:

$$\begin{array}{r} 123 \\ \underline{-\ 91} \\ 32 \end{array}$$

4. If there is nothing to borrow in the next left column (column contains a zero), first borrow for that column from its next left column.

EXAMPLE:

$$\begin{array}{r} 906 \\ \underline{-318} \\ \end{array} \qquad \begin{array}{r} 906 \\ \underline{-318} \\ 8 \end{array} \qquad \begin{array}{r} 906 \\ \underline{-318} \\ 88 \end{array} \qquad \begin{array}{r} 906 \\ \underline{-318} \\ 588 \end{array}$$

5. Check your subtraction by adding your answer to the subtracted number.

Problem		Check	
271	Original Number	271	Original Number
- 164	Subtracted Number	- 164	
107	Answer	+ 107	
		271	Check Answer

✔ **NOTE:** If you have solved the problem correctly, your check answer should be the same as the original number.

OBJECTIVE 6

Optional Activities/ Resources in Instructor's Guide

Multiply whole numbers.

1. Set up the problem by writing the larger number (original number) above the smaller number (multiplier), writing units under units, tens under tens, and so on.

✔ **NOTE:** You will get the correct answer [product] no matter which number is placed above the other, but the faster method places the larger above the smaller.

EXAMPLE: Multiply the number 53 and 4

53 Original Number
x 4 Multiplier

2. If the multiplier contains only one digit, multiply each digit in the original number by it, working from right to left.

   a. Multiply the units digit in the original number by the multiplier.

      EXAMPLE:

$$\begin{array}{r} 53 \\ \uparrow \\ \underline{\text{x } 4} \\ 2 \end{array}$$

   b. Write the answer units digit and insert necessary carry digit about next column in original number as required.

   c. Multiply the tens digit by the multiplier and add the carried digit as required.

      EXAMPLE:

$$\begin{array}{r} 53 \\ \nwarrow\; \\ \underline{\text{x } \;4} \\ 212 \end{array}$$

3. If the multiplier contains more than one digit, find partial products.

   a. Multiply each digit in original number by each digit in the multiplier, moving from right to left.

   b. Align partial products so that the right-hand digit of each is directly under its corresponding digit in the multiplier.

      EXAMPLE: Multiply the numbers 172 and 42

$$\begin{array}{rrrrrr} 174 & 174 & 174 & 174 & 174 & 174 \\ \uparrow & \nwarrow\; & \nwarrow & \nearrow & \uparrow & \nwarrow \\ \underline{\text{x } 42} & \underline{\text{x } 42} & \underline{\text{x } 42} & \underline{\text{x } 42} & \underline{\text{x } 42} & \underline{\text{x } 42} \\ 8 & 48 & 348 & 348 & 348 & 348 \\ & & & 6 & 96 & 696 \\ & & \uparrow & & & \uparrow \\ & & \text{First Partial Product} & & & \text{Second Partial Product} \end{array}$$

4. Add the partial products.

$$\begin{array}{rl} 174 & \\ \underline{\text{x } 42} & \\ 348 & \\ \underline{+\,696\;\;} & \\ 7308 & \text{Answer (Product)} \end{array}$$

OBJECTIVE 7

Optional Activities/
Resources in Instructor's
Guide

Divide whole numbers.

1. Set up the problem by writing the original number (number to be divided) inside a division frame, and by writing the divisor (number you are dividing by) outside the frame.

   EXAMPLE: How many times will 34 go into 3347?

   $$\text{Divisor } 34\overline{)3347} \text{ Original Number}$$

2. Determine how many times the divisor will go into the first digit of the original number. If it will not, write a zero in the answer space directly above the first digit, and then determine how many times the divisor will go into the first two numbers of the original number.

   ✔ **NOTE:** Continue trying to divide the original number by the divisor until a set of digits can be divided. Remember to write a zero each time the set of digits cannot be divided.

   EXAMPLE:

   $$\text{Divisor } \begin{array}{r} 0 \\ 34\overline{)3347} \end{array} \text{ 34 goes into 3 zero times}$$

   $$\text{Divisor } \begin{array}{r} 00 \\ 34\overline{)3347} \end{array} \text{ 34 goes into 33 zero times}$$

   $$\text{Divisor } \begin{array}{r} 009 \\ 34\overline{)3347} \end{array} \text{ 34 goes into 334 nine times}$$

3. Multiply the divisor by the answer (digit above frame); write this answer under the digit(s) that divisor went into, and subtract.

   EXAMPLE:

   $$\begin{array}{r} 34 \\ \underline{\times\ \ 9} \\ 306 \end{array}$$

   Multiply the divisor (34) by answer (9)

   $$\begin{array}{r} 009 \\ 34\overline{)3347} \\ -\ \underline{306} \\ 28 \end{array}$$

   Write the answer under 334, the digits the divisor went into, and subtract

4. Bring down the next unused digit from the original number, and place it to the right of the subtracted difference (remainder)—even if the remainder is zero.

   EXAMPLE:

   $$\begin{array}{r} 009 \\ 34\overline{)3347} \\ -\ \underline{306}\downarrow \\ 287 \end{array}$$

5. Determine how many times the divisor will go into this new number; write your answer in the answer space above the digit that was brought down.

EXAMPLE:

$$\begin{array}{r} 0098 \\ 34\overline{)3347} \\ -\underline{306} \\ 287 \end{array}$$

6. Multiply the divisor by the last digit you wrote in the answer; write this product under the digits that divisor went into and subtract.

EXAMPLE:

$$\begin{array}{r} 34 \\ \underline{\times\ 8} \\ 272 \end{array}$$

Multiply the divisor (34) by the last digit of the answer (8).

$$\begin{array}{r} 0098 \\ 34\overline{)3347} \\ -\underline{306} \\ 287 \\ -\underline{272} \\ 15 \end{array}$$

Write the product under 287, the digits that the divisor went into, and subtract.

7. Continue this process until all numbers in the original number are used.

8. Write any remaining subtracted differences as a remainder.

EXAMPLE:

$$\begin{array}{rl} 0098 & \\ 34\overline{)3347} & \\ -\underline{306} & \\ 287 & \\ -\underline{272} & \\ 15 & \text{Remainder} \end{array}$$

9. Check your answer by multiplying your answer times the divisor and adding the remainder to this number.

✔ **NOTE:** If you have solved the problem correctly, your check answer should be the same as your original number.

EXAMPLE:

$$\begin{array}{rl} 98 & \text{Answer} \\ \underline{\times\ 34} & \text{Divisor} \\ 392 & \\ \underline{294} & \\ 3332 & \\ \underline{+\ \ 15} & \text{Remainder} \\ 3347 & \text{Check Answer (Same as original number)} \end{array}$$

OBJECTIVE 8

Optional Activities/ Resources in Instructor's Guide

Distinguish among types of fractions.

- **Proper** — Top number of fraction (numerator) is smaller than bottom number of fraction (denominator)

  EXAMPLE: $\frac{7}{8}$ Numerator / Denominator

- **Improper** — Top number of fraction (numerator) is larger than bottom number of fraction (denominator)

  EXAMPLE: $\frac{9}{8}$ $\frac{16}{16}$

- **Mixed numbers** — Contains a whole number and a proper fraction

  EXAMPLE: 9½, 1⅞, 4¾

OBJECTIVE 9

Optional Activities/ Resources in Instructor's Guide

Reduce fractions to lowest terms.

- Divide the numerator and denominator by the largest whole number that will go into each evenly.

  EXAMPLE: $\frac{4}{16} = \frac{4 \div 4}{16 \div 4} = \frac{1}{4}$

  ✔ **NOTE:** The fraction ¼ is reduced to its lowest term because the numerator [1] and the denominator [4] cannot be divided by the same number.

OBJECTIVE 10

Optional Activities/ Resources in Instructor's Guide

Convert mixed numbers to improper fractions.

1. Multiply the whole number by the denominator of the fraction.

   EXAMPLE: Convert 4⅜ to an improper fraction.

   8 x 4 = 32

2. Add your answer to the numerator.

   EXAMPLE: 32 + 3 = 35

3. Place this sum over the original denominator.

   EXAMPLE: $\frac{35}{8}$ Improper Fraction

OBJECTIVE 11

Optional Activities/
Resources in Instructor's
Guide

Convert improper fractions to mixed numbers.

1. Divide the numerator by the denominator.

   EXAMPLE: Convert 18⁄15 to a mixed number

$$\begin{array}{r l} & 01 \\ 15\overline{)18} & \\ \underline{15} & \\ 3 & \text{Remainder} \end{array}$$

2. Place the remainder over the denominator.

   EXAMPLE: $\frac{3}{15}$ $\begin{array}{l}\text{Remainder}\\ \text{Denominator}\end{array}$

3. Reduce this fraction if necessary.

   EXAMPLE: $\frac{3}{15} = \frac{3 \div 3}{15 \div 3} = \frac{1}{5}$

4. Add the reduced fraction to the whole number obtained by dividing the numerator by the denominator.

   EXAMPLE: $1 + \frac{1}{5} = 1\frac{1}{5}$ Mixed Number

OBJECTIVE 12

Optional Activities/
Resources in Instructor's
Guide

Add fractions.

- **Like fractions**

  ✔ **NOTE:** Like fractions are those having the same, or common, denominators.

  EXAMPLES: ¼ and 2⁄4, 5⁄8 and 5⁄8, 3⁄16 and 1⁄16

  1. Add the numerators.

  2. Place the sum of the numerators over the common denominator.

  3. Convert to mixed numbers and reduce as required.

     EXAMPLE 1: Add ¼ and 2⁄4

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

     EXAMPLE 2: Add 5⁄8 and 5⁄8

     $$\frac{5}{8} + \frac{5}{8} = \frac{5 + 5}{8} = \frac{10}{8} = 10 \div 8 = 1\frac{2}{8} = 1\frac{1}{4}$$

EXAMPLE 3: Add $^{3}/_{16}$ and $^{1}/_{16}$

$$\frac{1}{16} + \frac{3}{16} = \frac{1+3}{16} = \frac{4}{16} = \frac{4 \div 4}{16 \div 4} = \frac{1}{4}$$

- **Unlike fractions**

EXAMPLE 1: $^{11}/_{12} + {^{1}/_{9}}$

1. Change to like fractions.

   a. Find the lowest number into which the denominator can be divided evenly (lowest common denominator).

   36 is the lowest number into which both 12 and 9 can be divided evenly.

   b. Multiply the numerators and denominators of each fraction by the number of times its denominator can be divided into the lowest common denominator.

   36 divided by 12 = 3

   $$\frac{11}{12} = \frac{11 \text{ x } 3}{12 \text{ x } 3} = \frac{33}{36}$$

   36 divided by 9 = 4

   $$\frac{1}{9} = \frac{1 \text{ x } 4}{9 \text{ x } 4} = \frac{4}{36}$$

2. Add like fractions and reduce or convert to mixed numbers as required.

$$\frac{33}{36} + \frac{4}{36} = \frac{33+4}{36} = \frac{37}{36} = 1\frac{1}{36}$$

EXAMPLE 2: Add $^{1}/_{8}$ and $^{3}/_{4}$

$\frac{1}{8}$ remains $\frac{1}{8}$ and $\frac{3}{4} = \frac{6}{8}$

$$\frac{1}{8} + \frac{6}{8} = \frac{1+6}{8} = \frac{7}{8}$$

- **Mixed numbers**

  1. Add whole numbers.
  2. Add fractions, first finding common denominations if necessary, and reduce or convert to mixed numbers as necessary.
  3. Add the sums of steps 1 and 2.

EXAMPLE 1: $3\frac{1}{8}$ and $7\frac{3}{8}$

$3 + 7 = 10$ Add whole numbers.

$\frac{1}{8} + \frac{3}{8} = \frac{1+3}{8} = \frac{4}{8} = \frac{1}{2}$ Add fractions and reduce.

$10 + \frac{1}{2} = 10\frac{1}{2}$ Add the sums of steps 1 and 2.

EXAMPLE 2: Add $4\frac{2}{3}$ and $1\frac{5}{6}$

$4 + 1 = 5$ Add whole numbers.

$\frac{2}{3} + \frac{5}{6} = \frac{4+5}{6+6}$ Find common denominator.

$\frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$ Add fractions, convert to mixed number, and reduce.

$5 + 1\frac{1}{2} = 6\frac{1}{2}$ Add sums of steps 1 and 2.

OBJECTIVE 13

Optional Activities/
Resources in Instructor's
Guide

Subtract fractions.

- **Like fractions**

  1. Subtract the smaller numerator from the larger numerator.

EXAMPLE: Subtract $\frac{1}{16}$ from $\frac{7}{16}$

$7 - 1 = 6$

2. Place the subtraction answer over the common denominator.

   EXAMPLE: $\frac{6}{16}$

3. Reduce to lowest terms as required.

   EXAMPLE: $\frac{6}{16} = \frac{3}{8}$

- **Unlike fractions**

1. Change to like fractions.

   EXAMPLE: Subtract ½ from ¾

   $\frac{3}{4}$ remains the same because 4 is the common denominator.

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

2. Subtract now as for like fractions.

   EXAMPLE: $\frac{3}{4} - \frac{2}{4} = \frac{3 - 2}{4} = \frac{1}{4}$

3. Reduce to the lowest terms as required.

- **Mixed numbers**

1. Convert mixed numbers to like fractions.

   EXAMPLE: Subtract 3½ from 5⅛

   $5\frac{1}{8} - 3\frac{1}{2} =$

   $5\frac{1}{8} - 3\frac{4}{8} =$

2. Borrow a one from the original whole number if needed, convert the one to a like fraction, and add it to the smaller fraction.

   ✔ **NOTE:** This step is needed only if the like fraction in the original number is smaller than the like fraction in the subtracted number.

   EXAMPLE: Subtract 3½ from 5⅛

   $5\frac{1}{8} - 3\frac{4}{8} = (4\frac{8}{8} + \frac{1}{8}) - 3\frac{4}{8}$

   $= 4\frac{9}{8} - 3\frac{4}{8}$

3. Subtract the whole number from the whole number and the like fraction from the like fraction.

   EXAMPLE: $4\frac{9}{8} - 3\frac{4}{8} = 1\frac{5}{8}$

OBJECTIVE 14

Optional Activities/
Resources in Instructor's
Guide

Multiply fractions.

1. Convert mixed numbers to improper fractions, if necessary.

2. Multiply numerators by numerators and denominators by denominators.

3. Write the product of the numerators over the product of the denominators.

4. Convert improper fractions to mixed numbers and reduce as required.

   EXAMPLE 1: Multiply ½ by ¾

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

   EXAMPLE 2: Multiply 1¼ by ½

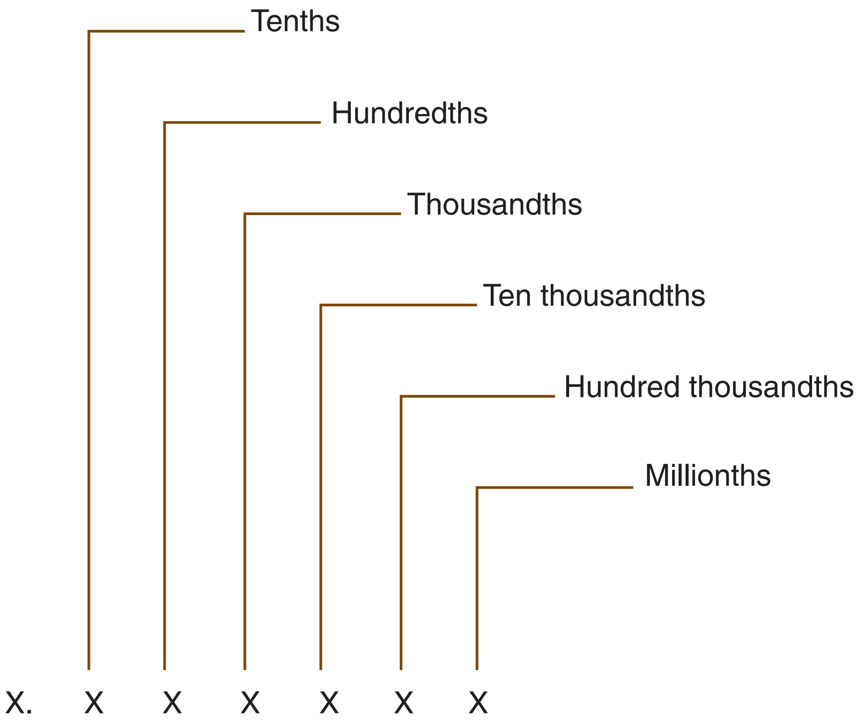
   $1\frac{1}{4} = \frac{5}{4}$ Convert to improper fraction.

   $$\frac{5}{4} \times \frac{1}{2} = \frac{5 \times 1}{4 \times 2} = \frac{5}{8}$$

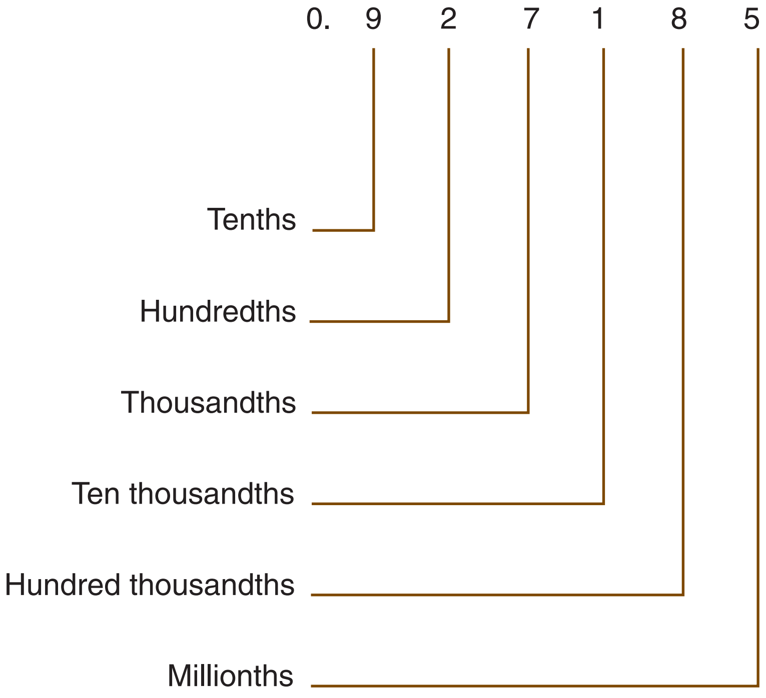
OBJECTIVE 15

Optional Activities/
Resources in Instructor's
Guide

Label the place values of a decimal number.



EXAMPLE:



✔ **NOTE:** The number in the example is read as nine hundred twenty-seven thousand, one hundred eighty-five millionths.

OBJECTIVE 16

Optional Activities/ Resources in Instructor's Guide

Add decimal numbers.

1. Set up problem as for addition of whole numbers, aligning decimal points directly under each other.

   ✔ **NOTE:** Zeros may be added to ensure that units line up under units, tens under tens, and so on. Whole numbers have an understood decimal point to the right of the units digit: 7 is 7., 75 is 75., and 754 is 754.

   EXAMPLE: Add 0.857, 2.1, 753, and 370.057.

0.857		000.857
2.1		002.100
753	or	753.000
+ 370.057		+ 370.057

2. Add each column of numbers as if whole numbers.

3. Locate the decimal point in the answer by placing it directly under the decimal points above.

   EXAMPLE:

000.857	
002.100	
753.000	
+ 370.057	
1126.014	Answer

OBJECTIVE 17

Optional Activities/ Resources in Instructor's Guide

Subtract decimal numbers.

1. Set up problem as for subtraction of whole numbers, aligning decimal points directly under each other.

   EXAMPLE: Subtract 1.397 from 8.120

8.120	Original Number
- 1.397	Subtracted Number

2. Subtract each column of numbers as if they were whole numbers.

3. Locate the decimal point in the answer by placing it directly under the decimal points above.

4. Check your subtraction by adding your answer to the subtracted number.

   ✔ **NOTE:** If you have solved the problem correctly, your check answer should be the same as the original number.

   EXAMPLE:

8.120	Original Number
- 1.397	Subtracted Number
+ 6.723	Answer (Difference)
8.120	Check Answer

OBJECTIVE 18

Optional Activities/
Resources in Instructor's Guide

Multiply decimal numbers.

1. Set up the problem and multiply as if you were multiplying whole numbers.

   ✔ **NOTE:** Do *not* align the decimal points in columns when setting up multiplication problems for decimal numbers.

   EXAMPLE: Multiply 27.935 by 7.07

$$\begin{array}{rl} 27.935 & \text{Original Number} \\ \underline{\text{x}\ \ 7.07} & \text{Multiplier} \\ 195545 & \\ \underline{1955450\ \ } & \\ 19750045 & \end{array}$$

2. Count the number of decimal places to the right of the decimal points in the multiplier and original number.

$$\begin{array}{lrrl} \text{EXAMPLE:} & 27.935 & 3 & \text{Decimal Places} \\ & \underline{\text{x}\ 7.07} & \underline{+2} & \text{Decimal Places} \\ & & 5 & \text{Total Decimal Places} \end{array}$$

3. Locate the decimal point in the answer by beginning at the far right digit and counting off as many places to the left as the total decimal places found in Step 2.

$$\begin{array}{lrl} \text{EXAMPLE:} & 27.935 & \\ & \underline{\text{x}\ \ 7.07} & \\ & 195545 & \\ & \underline{1955450\ \ } & \\ & 197.50045 & \text{5 Decimal Places} \end{array}$$

OBJECTIVE 19

Optional Activities/
Resources in Instructor's Guide

Divide decimal numbers.

1. Set up the problem as you would for the division of whole numbers.

   EXAMPLE: Divide 0.25 by 0.005

   Divisor $0.005\overline{)0.25}$ Original Number

2. Move the decimal point in the divisor to the right of the far right digit in the divisor.

   EXAMPLE: $\underset{\curvearrowright}{0.005.}\overline{)0.25}$

3. Move the decimal point in the original number to the right by the same number of decimal places that you moved the decimal point in the divisor, adding zeros to the original number if necessary.

   EXAMPLE 1: $0.\underset{\curvearrowright}{005}.\overline{)0.\underset{\curvearrowright}{250}}.$

   ✔ **NOTE:** If you are dividing a decimal number into a whole number, remember that whole numbers have an understood decimal point to the right of the units digit.

   EXAMPLE 2: $0.03\overline{)9}$ becomes $0.\underset{\curvearrowright}{03}.\overline{)9.\underset{\curvearrowright}{00}.}$

4. Place a decimal point in the answer space directly above the repositioned decimal point in the original number.

   EXAMPLE: $$\begin{array}{r} . \\ 0.\underset{\curvearrowright}{005}\overline{)0.\underset{\curvearrowright}{250}.} \end{array}$$

5. Divide as for whole numbers.

   EXAMPLE: $$\begin{array}{r} 50. \\ 0005.\overline{)0250.} \\ \underline{025} \\ 00 \end{array}$$

6. Check your division by multiplying the original divisor (before the decimal point was moved) by your answer and adding any remainder to this number.

   ✔ **NOTE:** If you have solved the problem correctly, your check answer should be the same as the original number.

   EXAMPLE: 0.005 Divisor
   x 50 Answer
   0.250 Check Answer (Same as original number)

OBJECTIVE 20

Required Activities/
Resources
— Transparencies 1-3

Optional Activities/
Resources in Instructor's
Guide

Convert decimal fractions to common fractions.

Your instructor will show you transparencies illustrating fractional and decimal equivalents.

1. Remove the decimal point.
2. Place the number over its respective denominator (10's, 100's, 1000's).
3. Cancel zeros when possible.
4. Reduce to the lowest term.

EXAMPLE: Convert .25 to a common fraction

$.25 = 25$

$= \frac{25}{100}$

$= \frac{1}{4}$

EXAMPLE: Convert .52 to a common fraction

$.52 = 52$

$= \frac{52}{100}$

$= \frac{13}{25}$

OBJECTIVE 21

Convert common fractions to decimal numbers and percentages.

Optional Activities/
Resources in Instructor's
Guide

- **Fractions to decimals** — Divide the numerator by the denominator

  EXAMPLE: Convert ⅝ to a decimal

  5 Numerator
  8 Denominator

$$\begin{array}{r} 0.625 \\ 8\overline{)5.000} \\ \underline{4.8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

- **Fractions to percentages**

  ✔ **NOTE:** Percent means that a number is a fraction of 100.

1. Convert the fractions to decimals by dividing the numerator by the denominator.
2. Move the decimal point in the answer two places to the right.
3. Place the percent symbol after the number.

   EXAMPLE: Convert 7⁄33 to a percentage

   7 Numerator
   33 Denominator

$$\begin{array}{r} 0.2121 = 21.21\% \\ 33\overline{)7.0000} \\ \underline{66} \\ 40 \\ \underline{33} \\ 70 \\ \underline{66} \\ 40 \\ \underline{33} \\ 7 \end{array}$$

OBJECTIVE 22

Optional Activities/
Resources in Instructor's
Guide

Identify decimal and fractional equivalents.

1/64 — .015625
1/32 — .03125
3/64 — .0468752
1/16 — .0625
5/64 — .078125
3/32 — .09375
7/64 — .109375
1/8 — .125
9/64 — .140625
5/32 — .15625
11/64 — .171875
3/16 — .1875
13/64 — .203125
7/32 — .21875
15/64 — .234375
1/4 — .25
17/64 — .265625
9/32 — .28125
19/64 — .296875
5/16 — .3125
21/64 — .328125
11/32 — .34375
23/64 — .359375
3/8 — .375
25/64 — .390625
13/32 — .40625
27/64 — .421875
7/16 — .4375
29/64 — .453125
15/32 — .46875
31/64 — .484375
1/2 — .5

33/64 — .515625
17/32 — .53125
35/64 — .5468752
9/16 — .5625
37/64 — .578125
19/32 — .59375
39 64 — .609375
5/8 — .625
41/64 — .640625
21/32 — .65625
43/64 — .671875
11/16 — .6875
45/64 — .703125
23/32 — .71875
47/64 — .734375
3/4 — .75
49/64 — .765625
25/32 — .78125
51/64 — .796875
13/16 — .8125
53/64 — .828125
27/32 — .84375
55/64 — .859375
7/8 — .875
57/64 — .890625
29/32 — .90625
59/64 — .921875
15/16 — .9375
61/64 — .953125
31/32 — .96875
63/64 — .984375
1 — 1.

OBJECTIVE 23

Optional Activities/
Resources in Instructor's
Guide

Convert percentages to fractions and decimal numbers.

- **Percentages to fractions**

  1. Drop the percent symbol.
  2. Place the number over 100.
  3. Reduce to lowest terms if necessary.

  EXAMPLE: Convert 38% to a fraction

$$\begin{aligned} 38\% &= 38 \\ &= \frac{38}{100} \\ &= \frac{19}{50} \end{aligned}$$

- **Percentages to decimals**

  1. Drop the percent symbol.
  2. Move the decimal point two places to the left.

  EXAMPLE: Convert 74% to a decimal

$$\begin{aligned} 74\% &= 74 \\ &= 0.74 \end{aligned}$$

OBJECTIVE 24

Optional Activities/
Resources in Instructor's
Guide

Solve percentage problems.

✔ **NOTE:** Percentage problems may involve solving for the percent ("16 is what percent of 80?"), the part ("What number is 20% of 80?"), or the whole ("16 is 20% of what number?").

1. Write the unknown as "X".

   EXAMPLE: 16 is what percent of 80?

   16 is X percent of 80.

   ✔ **NOTE:** The unknown may be the percent, or the whole.

2. Write the percent (known or unknown) as a fraction with a denominator of 100.

   EXAMPLE: 16 is $\frac{X}{100}$ percent of 80

3. Write the part and the whole as a fraction, writing the part as the numerator and the whole as the denominator.

   EXAMPLE: $\begin{matrix}\underline{16} & \text{Part}\\ 80 & \text{Whole}\end{matrix}$

4. Set up the equation by writing the two fractions with an equal sign between them.

   EXAMPLE: $\begin{matrix}\underline{\ X\ } & = & \underline{16}\\ 100 & = & 80\end{matrix}$

5. Solve the equation by multiplying the numerator of each fraction by the denominator of the other.

   ✔ **NOTE:** This process is known as *cross multiplying*.

   EXAMPLE: $\begin{matrix}\underline{\ X\ } & = & \underline{16}\\ 100 & = & 80\end{matrix}$

   $80X = 1600$

6. Divide each side of the equation by the multiplier of X.

   EXAMPLE: $80X = 1600$

   $X = 20\%$

   16 is 20% of 80

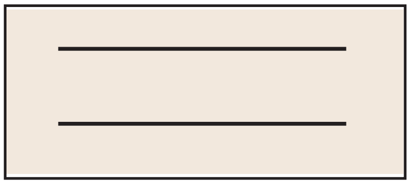
OBJECTIVE 25

Optional Activities/ Resources in Instructor's Guide

Match terms used in geometry to their correct descriptions.

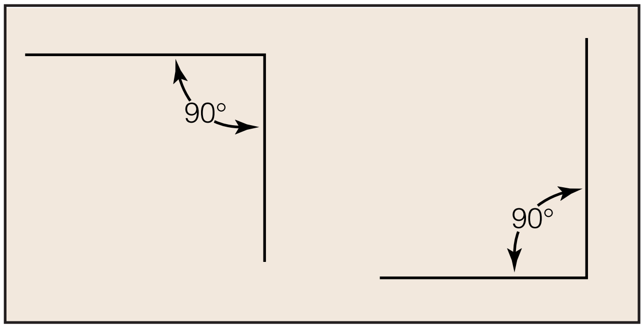
- **geometric figure** — shape formed by straight or curved lines
- **perimeter** — outer limits or boundary
- **lineal** — relating to, consisting of, or resembling a straight line
- **parallel** — extending in the same direction; equal distance apart and never meeting (Figure 2)

FIGURE 2



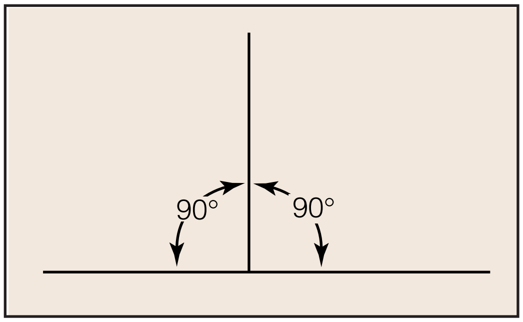
- **right angle** — angle formed by two lines perpendicular to each other; 90 degree angle (Figure 3)

FIGURE 3



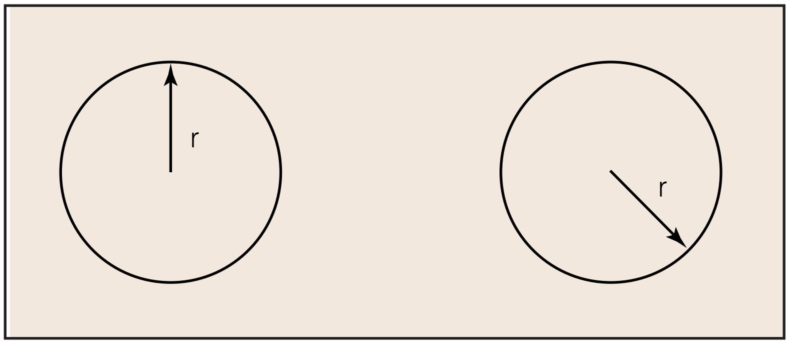
- **perpendicular** — line or surface at a right angle to another line or surface (Figure 4)

FIGURE 4



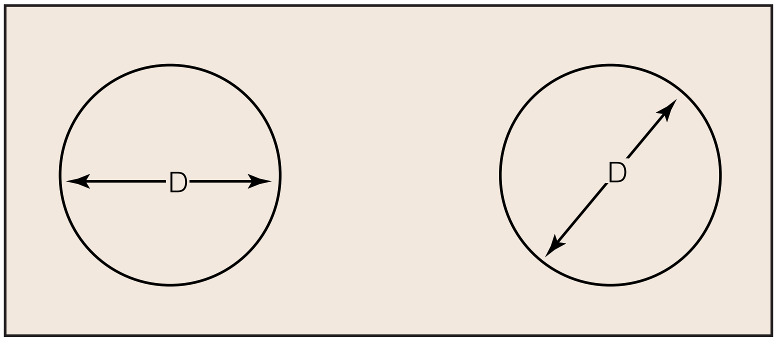
- **radius** — line from the center of a circle to any point on the edge of the circle (Figure 5)

FIGURE 5



- **diameter** — distance between the outer edges of a circle through the center point (Figure 6)

FIGURE 6

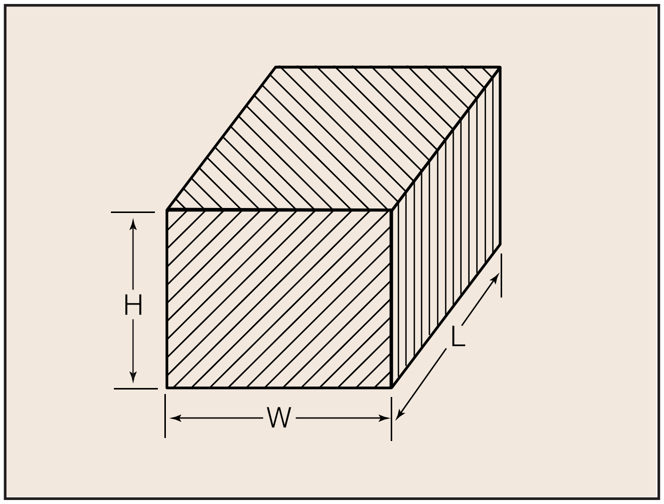


- **circumference** — distance around the outer edge of circle
- **pi** — Greek letter (∏) representing the ratio of a circle's circumference to its diameter; ratio approximately 3.1416
- **area** — measure of a flat surface; expressed in square units

EXAMPLE: W x L = Area is square units

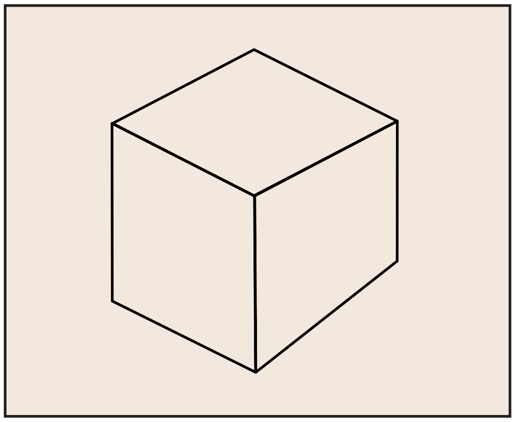
- **volume** — space occupied by a body; expressed in cubic units (Figure 7)

FIGURE 7



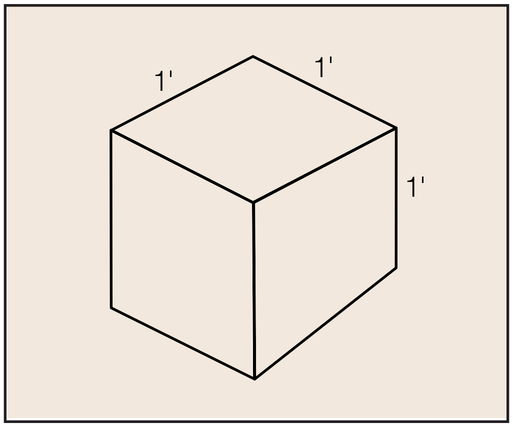
- **cubic unit** — unit with three equal dimensions including length, width, and height (Figure 8)

FIGURE 8



- **cubic foot** — volume of an object that is 1 foot long, 1 foot wide, and 1 foot high (Figure 9)

FIGURE 9



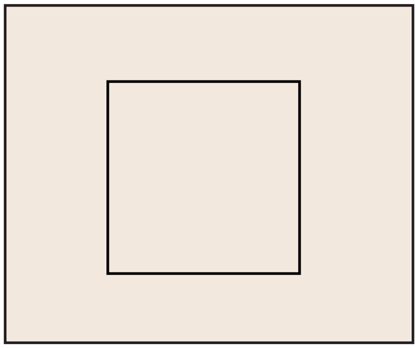
OBJECTIVE 26

Match types of geometric figures to their correct descriptions.

Optional Activities/ Resources in Instructor's Guide

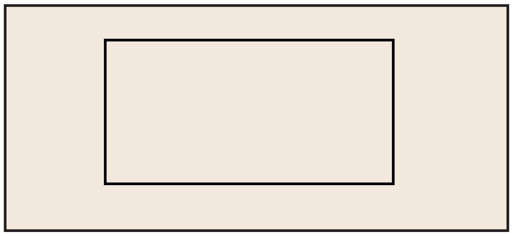
- **square** — figure having four sides of equal length and four right angles (Figure 10)

FIGURE 10



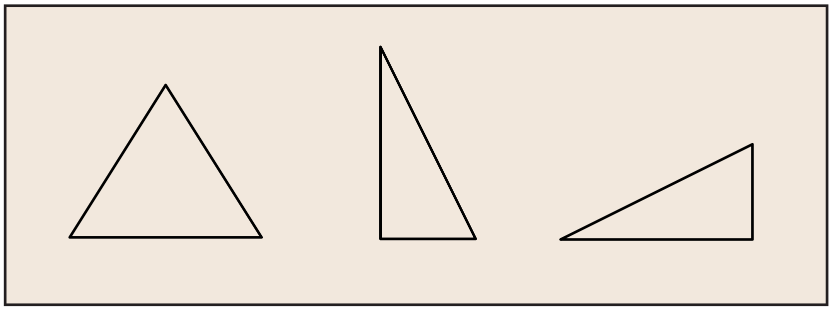
- **rectangle** — figure with two parallel ends of equal length, two parallel sides of equal length, and four right angles (Figure 11)

FIGURE 11



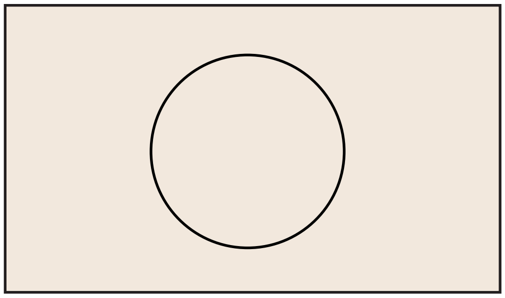
- **triangle** — figure having three side and three angles (Figure 12)

FIGURE 12



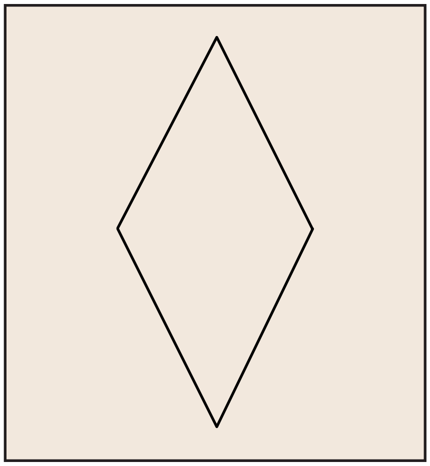
- **circle** — flat, round figure formed by one curved line; all points of the curved line are equidistant from the center point (Figure 13)

FIGURE 13



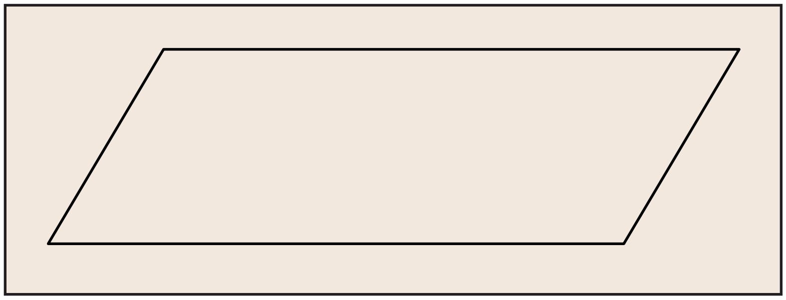
- **rhombus** — figure having no right angles and four sides of equal length (Figure 14)

FIGURE 14



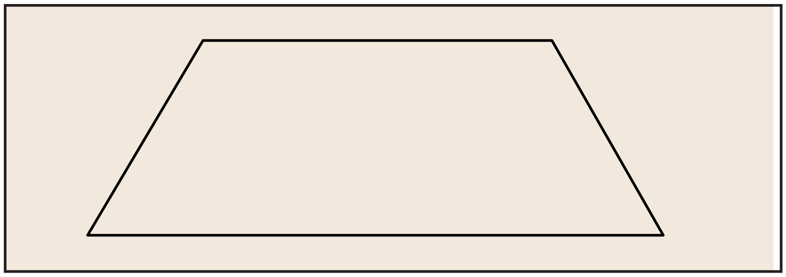
- **parallelogram** — figure such as a square, rectangle, or rhombus with two parallel ends of equal length and two parallel sides of equal length (Figure 15)

FIGURE 15



- **trapezoid** — figure with only one pair of parallel opposite sides (Figure 16)

FIGURE 16



OBJECTIVE 27

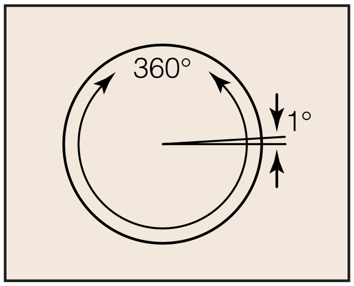
Optional Activities/ Resources in Instructor's Guide

Match units of measure to their correct equivalents.

- **inch (")** — equal to one-twelfth of a foot (1⁄12') or one thirty-sixth of a yard (1⁄36 yard)
- **foot (')** — equal to twelve inches (12") or one-third of a yard (1⁄3 yard)

- **yard** — equal to three feet (3') or thirty-six inches (36")
- **rod** — equal to sixteen and one-half feet (16½')
- **mile** — equal to five thousand, two hundred and eighty feet (5280')
- **degree (°)** — equal to 1/360 of a circle (Figure 17)

FIGURE 17



OBJECTIVE 28

Required Activities/ Resources
— Transparencies 4 and 5

Optional Activities/ Resources in Instructor's Guide

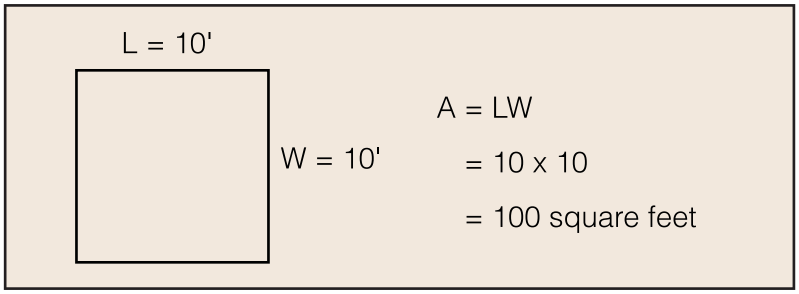
Calculate the area of geometric figures.

Your instructor will show you transparencies that illustrate how to calculate the area of geometric figures.

✔ **NOTE:** Area is always labeled in square units of measure.

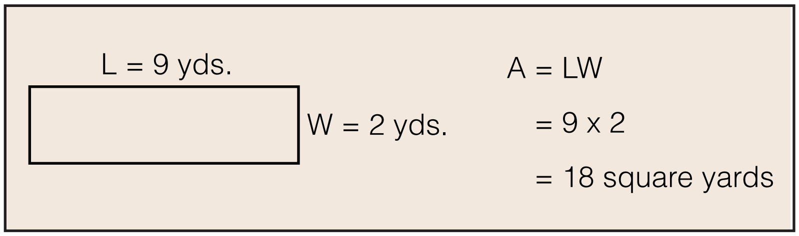
- **square** — use the formula: Area = Length x Width or A = LW (Figure 18)

FIGURE 18



- **rectangle** — use the formula: Area = Length x Width or A = LW (Figure 19)

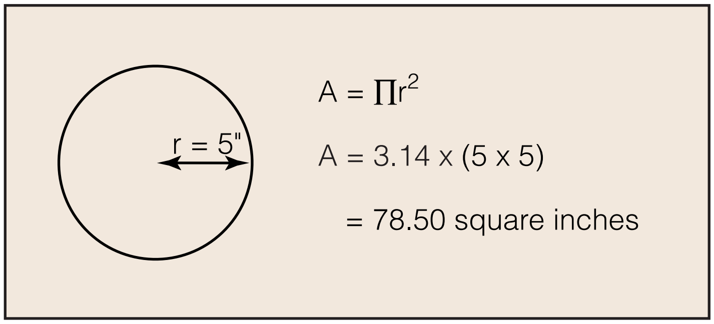
FIGURE 19



- **circle** — use the formula: Area = ∏r^2 (radius x radius) (Figure 20)

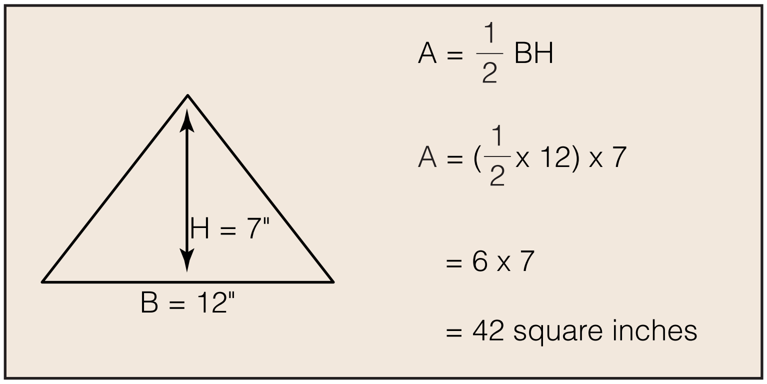
  ✔ **NOTE:** Pi [∏] is 3.14, which is the circumference of a circle divided by the diameter of the circle.

  FIGURE 20

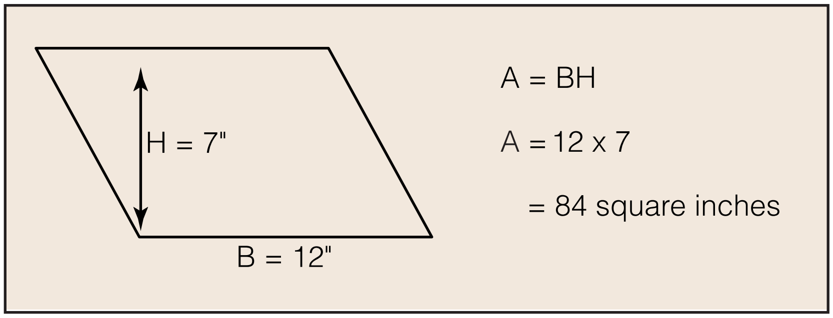
- **triangle** — use the formula: Area = ½ Base x Height, or A = ½ BH (Figure 21)

  FIGURE 21

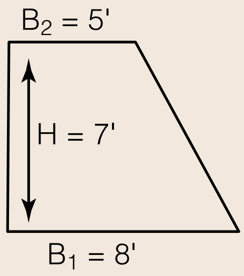
- **parallelogram** — use the formula: Area = Base x Height, or A = BH (Figure 22)

  FIGURE 22

- **trapezoid** — use the formula: Area = ½ H (B_1 + B_2) (Figure 23)

FIGURE 23



$$A = \frac{1}{2} H (B_1 + B_2)$$

$$A = (\frac{1}{2} x 7) x (8 + 5)$$

$$= \frac{7}{2} x 13$$

$$= \frac{7}{2} x \frac{13}{1}$$

$$= \frac{91}{2}$$

$$= 45\frac{1}{2} \text{ square feet}$$

OBJECTIVE 29

Optional Activities/
Resources in Instructor's
Guide

Calculate volume of solid figures.

✔ **NOTE:** Volume is always measured in cubic units.

- Using the counting method — Use formula: Cubic Units = Number of Cubes in Layer x Number of Layers (Figure 24)

FIGURE 24

Cubic Units = Number of Cubes in Layer x Number of Layers

= 9 x 2

= 18 cubes

- Using the formula and converting as necessary

Using the formula: Volume = Length x Width x Height or V = LWH

EXAMPLE 1:

Where L = 3 feet, W = $\frac{1}{2}$ foot, and H = 1 $\frac{1}{2}$ feet

$$V = LWH$$

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

$$= \frac{9}{4} \text{ or } 2 \frac{1}{4} \text{ cubic feet}$$

EXAMPLE 2:

Where L = 10 feet, W= 8 feet, and H = 3 feet

$$\begin{aligned} V &= LWH \\ &= 10 \text{ x } 8 \text{ x } 3 \\ &= 240 \text{ cubic feet} \end{aligned}$$

OBJECTIVE 30

Optional Activities/
Resources in Instructor's
Guide

Estimate cubic yards.

$$\text{Cubic Yards} = \frac{\text{Width in Feet x Length in Feet x Thickness in Feet}}{27}$$

✔ **NOTE:** The formula for converting will differ, depending on the units being converted. The formula for cubic yards is given in the example because it is the conversion most often used by cement masons. Because given measurements are usually in feet and inches, thickness in inches must be broken down by using fractions or decimals.

EXAMPLE 1:

Converting to yards, using fractions where width = 30', length = 60', and thickness = 4"

$$\text{Cubic Yards} = \frac{\text{Width in Feet x Length in Feet x Thickness in Feet}}{27}$$

$$= \frac{30' \text{ x } 60' \text{ x } 4''}{27}$$

$$= \frac{30' \text{ x } 60' \text{ x } \frac{1}{3}'}{27}$$

$$= 22.22 \text{ cubic yards}$$

EXAMPLE 2:

Converting to yards, using decimals where width = 30', length = 60', and thickness = 4"

$$\text{Cubic Yards} = \frac{\text{Width in Feet x Length in Feet x Thickness in Feet}}{27}$$

$$= \frac{30' \text{ x } 60' \text{ x } .33'}{27}$$

$$= \frac{594}{27}$$

$$= 22 \text{ cubic yards}$$

OBJECTIVE 31

Required Activities/
Resources
— Transparency 6

Optional Activities/
Resources in Instructor's
Guide

Solve basic ratio and proportion problems.

Your instructor will show you a transparency that illustrates ratio and proportion problems.

- To increase or decrease proportionally, multiply or divide each number in the ratio by the same number.

  ✔ **NOTE:** Ratio indicates parts of material per mix; proportion indicates that the ratio is the same but the quantity may differ.

  EXAMPLE 1: You want to find half of the ratio 1:1:3

  Divide each number in the ratio by 2 to get 0.5:0.5:1.5

  EXAMPLE 2: You need three times the ratio 1:1:3

  Multiply each number in the ratio by 3 to get 3:3:9

OBJECTIVE 32

Complete Assignment Sheet 1.

OBJECTIVE 33

Complete Assignment Sheet 2.

OBJECTIVE 34

Complete Assignment Sheet 3.

OBJECTIVE 35

Complete Assignment Sheet 4.

OBJECTIVE 36

Complete Assignment Sheet 5.

OBJECTIVE 37

Complete Assignment Sheet 6.

OBJECTIVE 38

Complete Assignment Sheet 7.

OBJECTIVE 39

Complete Assignment Sheet 8.

OBJECTIVE 40

Complete Assignment Sheet 9.

OBJECTIVE 41	**Complete Assignment Sheet 10.**
OBJECTIVE 42	**Complete Assignment Sheet 11.**
OBJECTIVE 43	**Complete Assignment Sheet 12.**
OBJECTIVE 44	**Complete Assignment Sheet 13.**
OBJECTIVE 45	**Complete Assignment Sheet 14.**
OBJECTIVE 46	**Complete Assignment Sheet 15.**
OBJECTIVE 47	**Complete Assignment Sheet 16.**
OBJECTIVE 48	**Complete Assignment Sheet 17.**
OBJECTIVE 49	**Complete Assignment Sheet 18.**
OBJECTIVE 50	**Complete Assignment Sheet 19.**
OBJECTIVE 51	**Complete Assignment Sheet 20.**
OBJECTIVE 52	**Complete Assignment Sheet 21.**

ASSIGNMENT SHEET 1

FUNDAMENTAL MATH

4

Name ______________________________________ Score__________

OBJECTIVE 32

Add whole numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Like most people, you probably use addition every day. For example, today you probably added coins together to pay for sodas and snacks. Every time you add, you use basic addition facts. The following exercises will form part of your cement masonry background and serve as a basis for completing other exercises and problems.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Solve each of the following addition problems. Show your work.

1. 2 + 9	2. 8 + 8	3. 7 + 6	4. 15 + 8	5. 81 + 27
6. 7 38 + 43	7. 55 88 + 99	8. 341 428 + 769	9. 472 564 + 881	10. 9876 5432 + 1122

Part 2

1. If a cement mason used 330 lineal feet of sidewalk forms on one job site, 570 on another job site, and 275 on another, how many lineal feet were used?

   Total lineal feet = ______________________

2. A concrete contractor ordered the following number of three foot metal form stakes at different dates: 256, 62, 575, and 242. How many form stakes should he be billed for?

   Total form stakes = ______________________

3. A concrete contractor paid $480 for cement, $108 for sand, $181 for tools, and $75 for bonding agent. What was the total cost for materials?

   Total cost of materials = $______________________

4. If it takes 1135 square feet of concrete for the first apartment, 1225 square feet for the second, 1220 square feet for the third, 1125 square feet for the fourth, and 7425 square feet for the last apartment, what would be the total square feet of concrete needed?

   Total square feet = ______________________

ASSIGNMENT SHEET 2

FUNDAMENTAL MATH

4

Name ______________________________ Score________

OBJECTIVE 33

Subtract whole numbers.

BASIC SKILLS

Reading
Mathematics
Critical Thinking
Employability

INTRODUCTION

Addition is the first fundamental operation in mathematics. Subtraction, the opposite of addition, is the process of finding the difference between two numbers. It is the second fundamental operation. You can check the accuracy of the answer obtained in a subtraction problem by simply adding the difference to the subtracted number. The sum of these two numbers will equal the original number if the answer is correct.

EXAMPLES:

12	Original Number	57	Original Number
- 7	Subtracted Number	- 35	Subtracted Number
+5	Answer (Difference)	+22	Answer (Difference)
12	Check Answer (Same as original number)	57	Check Answer

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Solve each of the following subtraction problems. Check your answer by adding the difference to the subtracted number. Show your work.

1. 9 - 5
2. 15 - 8
3. 75 - 22
4. 453 - 47
5. 742 - 318
6. 981 - 698
7. 1420 - 245
8. 3459 - 1649
9. 55722 - 4272
10. 98679 - 8957

Part 2

1. If a curb takes 172 curb forms and you have 46, how many more forms would you need?

   Number of forms needed = ______________________

2. If you have 542 square feet of plywood and it takes 1702 square feet of plywood to complete the job, how many more square feet will you need?

   Number of square feet needed = ______________________

3. You have a total of 6520 square feet of floor to repair at three different jobs. You have 470 square feet of repair on one job and 1640 square feet of repair on another. How many square feet of floor repair is on the remaining job?

   Number of square feet of floor repair = ______________________

4. A cement mason superintendent ordered 48,000 rebar chairs. Of these she used 4850 on one job, 12,720 on another job, and 1625 on another job. How many rebar chairs did she have left?

   Number of rebar chairs left = ______________________

FUNDAMENTAL MATH

Name ____Score__________

OBJECTIVE 34

Multiply whole numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Multiplication is the third basic operation in mathematics. It is a shortcut method of adding. For example, if you correctly add twelve 12's, the result will be 144, the same as 12 multiplied by 12. Some multiplication problems involve carrying. You may write down the carried digits, or simply remember them. Use the method that works best for you.

When multiplying by numbers that contain two or more digits, you must be careful to align the partial products properly. Write the right-hand digit of each partial product directly below the multiplying digit. This causes the partial products to be properly aligned so that tens will be added to tens, hundreds to hundreds, and so on.

EXAMPLES:

	1	←Carried Digit	11	←Carried Digits
8	53		756	
x 7	x 4		x 312	
56	212		1512	←First Practical Product
			756	←Second Practical Product
			2268	←Third Practical Product
			235872	←Product

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Solve each of the following multiplication problems. Show your work.

1. 6 x 7
2. 9 x 8
3. 54 x 6
4. 721 x 4
5. 1682 x 5
6. 78 x 26
7. 453 x 47
8. 314 x 527
9. 2143 x 235
10. 4123 x 1324

Part 2

1. If one load of gravel weighs 9769 pounds, how much would 7 loads weigh?

   Weight = ______________________

2. If a cement mason can trowel 1200 square feet per hour, how many square feet can he trowel in 8 hours?

   Number of square feet = ______________________

3. Three cement masons can form an average of 25 stair risers per person per day. What will be their total for 3 days work?

   Total = ______________________

4. Figure the time worked in 4 weeks by 12 cement masons who work 30 hours each week.

   Hours worked = ______________________

ASSIGNMENT SHEET 4

FUNDAMENTAL MATH

4

Name ______________________________________ Score_________

OBJECTIVE 35

Solve basic ratio and proportion problems.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Cement masons use division in many aspects of their work. Edge forms and other construction features are often installed in sets of the same size units. By dividing the space allowed for such structures by the size of the individual units, the cement mason can determine the number of units required. Division is also used to compute costs and expenses and in making estimates.

Division is the fourth and last basic operation in mathematics. Multiplication puts together — division takes apart. Division is the reverse of multiplication. Long division is the name used for division by numbers that cannot readily be used as simple dividers. Division answers are checked by multiplying the divisor by the answer and adding the remainder.

EXAMPLES:

```
                                          324
                                        3)972
         Answer                           9
Divisor)Original Number                    7
                                           6
                                           12
                                           12
```

```
     0111  Answer              Check:   111  Answer
   51)5678                            x  51  Divisor
     51                                 111
      57                               555
      51                               5661
       68                             + 17  Remainder
       51                              5678  Original Number
       17  Remainder
```

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Solve each of the following division problems. Check your answers by multiplying the divisor by the original number. Show your work.

1. $2\overline{)8}$ 2. $6\overline{)48}$ 3. $9\overline{)819}$ 4. $4\overline{)1248}$ 5. $13\overline{)39}$

6. $66\overline{)198}$ 7. $84\overline{)5212}$ 8. $124\overline{)345}$ 9 $464\overline{)829}$

10. $746\overline{)2872}$

Part 2

1. Four cement masons troweled 8280 square feet of floor in one day. What was the average number of square feet troweled by each cement mason that day?

   Average square feet = ______________________

2. A home buyer has requested that the driveway be installed with cut joints every 5 feet. How many joints will be needed if the driveway is 100 feet long? (Hint: Remember that the joints go BETWEEN the panels.)

   Number of joints needed = ______________________

3. A concrete contractor built 26 slabs in one addition. The projects required 2535 lineal feet of 2x4's. How many 2x4's were required for each slab?

   2x4's required = ______________________

4. A yard of concrete will cover 81 square feet, 4 inches thick. How much concrete will be needed for a 4-inch slab that is 1500 square feet?

   Concrete needed = ______________________

Name ____Score__________

OBJECTIVE 36

Distinguish among types of fractions.

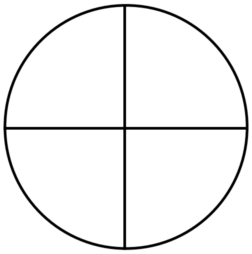
BASIC SKILLS

Reading Mathematics Critical Thinking Employability

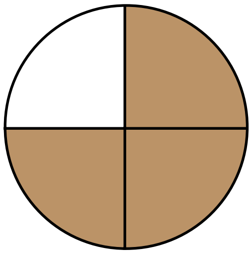
INTRODUCTION

Fractions are essential to the cement mason trade. Not only does the cement mason frequently use fractions for measurements, but much of the material used in the trade is sized by fractional units. Plywood comes in sizes ½- and ⅝-inch thick. Even lumber that is referred to in even numbers is actually measured in fractional inches. For example, a two-by-four board is actually 1½ inches by 3½ inches. This frequent use of fractions in the trade makes it necessary for the good cement mason to understand thoroughly how to work with fractions.

When something is divided into parts that are all the same size, or of equal size, it is divided into fractional parts. For example, the circle below is divided into four fractional parts.



To talk about fractional parts, you use fractions. For example, one of the four parts of the circle below is unshaded, or ¼ of the circle is unshaded; three of the four parts of the circle are shaded, or ¾ of the circle is shaded.



In the fraction ¾, the 4 is called the denominator. It shows the number of equal parts into which the circle is divided. The 3 is called the numerator. It shows the number of parts that are used.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

1. Identify the numerator and denominator of each of the following fractions by filling in the blanks.

   a. In the fraction ⅝, the numerator is _______ and the denominator is _______.

   b. In the fraction 7⁄16, 7 is the _________________ and 16 is the _________________.

   c. In the fraction ¼, what is the numerator? _______ denominator? _______

2. Write the fractions that fit the following statements.

   ______ a. A fraction with a denominator of 16 and a numerator of 10.

   ______ b. A fraction with a numerator of 16 and a denominator of 32.

3. A cement mason cuts a piece of plywood into 8 equal pieces and then uses 1 of the 8 pieces.

   ______ a. Which number represents the numerator?

   ______ b. Which number represents the denominator?

   ______ c. What fractional part of the plywood did the cement mason use?

Part 2

Match the shaded portions of the following figures to the fractions they represent. Write the correct letters in the blanks.

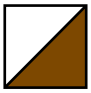
______ 1. 4⁄8
______ 2. 2⁄2
______ 3. 6⁄16
______ 4. ⅜
______ 5. ⅝

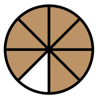
______ 6. ½
______ 7. 7⁄16
______ 8. ¾
______ 9. ¼
______ 10. ⅛

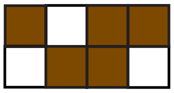
______ 11. ⅞
______ 12. 2⁄4
______ 13. 2⁄8
______ 14. 13⁄16
______ 15. 6⁄8

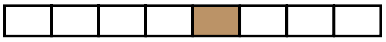
a.

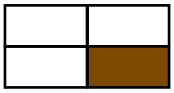

b.


c.


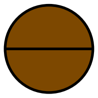
d.


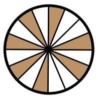
e.


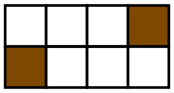
f.


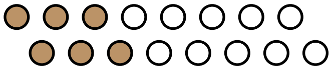
g.


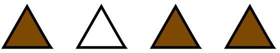
h.

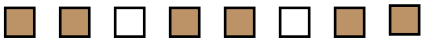

i.


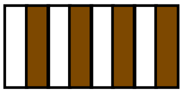
j.


k.


l.


m.


n.


o.


Name ____Score__________

OBJECTIVE 37

Reduce fractions to lowest terms.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

INTRODUCTION

Fractions are "reduced" to their lowest terms so that they are more readily understood or recognized. For example, ½ is more easily recognized than $^{16}/_{32}$.

To reduce a fraction to its lowest terms, divide the numerator and the denominator by the largest whole number that will go into both evenly.

EXAMPLES: $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$ $\qquad$ $\frac{12}{32} = \frac{12 \div 4}{32 \div 4} = \frac{3}{8}$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Reduce the following fractions to their lowest terms. Refer to the Information Sheet, objective 9, if necessary.

1. $^{4}/_{8}$ = _______________
2. $^{8}/_{16}$ = _______________
3. $^{2}/_{2}$ = _______________
4. $^{4}/_{16}$ = _______________
5. $^{12}/_{48}$ = _______________
6. $^{9}/_{24}$ = _______________
7. $^{16}/_{32}$ = _______________
8. $^{2}/_{4}$ = _______________
9. $^{9}/_{12}$ = _______________
10. $^{50}/_{100}$ = _______________

Name ______________________________________ Score _________

OBJECTIVE 38

Convert mixed numbers to improper fractions.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Fractions must have common denominators if they are to be added or subtracted. Fractions that have the same denominator are said to have a *common* denominator and to be *like fractions*. The easiest way to find a common denominator for two fractions is to multiply the numerator and the denominator of each fraction by the denominator of the other fraction.

EXAMPLE: Find a common denominator for the fractions $\frac{1}{4}$ and $\frac{3}{16}$ and convert to like fractions.

$$\frac{1}{4} = \frac{1 \text{ x } 16}{4 \text{ x } 16} = \frac{16}{64} \qquad \text{and} \qquad \frac{3}{16} = \frac{3 \text{ x } 4}{16 \text{ x } 4} = \frac{12}{64}$$

Because a common denominator is any denominator into which the denominators of both fractions will divide evenly, two fractions can have a number of common denominators. Although it is easy to find common denominators by multiplying the denominators by one another, this often leads to numbers that are awkward to work with. For that reason, fractions are usually added after the *lowest* common denominator has been found.

EXAMPLE: Common denominators for the fractions $\frac{1}{4}$ and $\frac{3}{16}$ include 16, 32, 48, 64, 80, and many more.

$\frac{4}{16}$ and $\frac{3}{16}$
$\frac{8}{32}$ and $\frac{6}{32}$
$\frac{12}{48}$ and $\frac{9}{48}$
$\frac{16}{64}$ and $\frac{12}{64}$
$\frac{20}{80}$ and $\frac{15}{80}$

The lowest common denominator is the lowest one into which the others can be divided evenly. To find the lowest common denominator, find any common denominator by the method shown above, and reduce it.

EXAMPLE: Convert the fractions $\frac{6}{15}$ and $\frac{3}{10}$ to like fractions with the lowest common denominator.

$$\frac{6}{15} = \frac{6 \times 10}{15 \times 10} = \frac{60}{150} = \frac{12}{30} \quad \text{and} \quad \frac{3}{10} = \frac{3 \times 15}{10 \times 15} = \frac{45}{150} = \frac{9}{30}$$

To change a fraction to its equivalent with a higher denominator, multiply the denominator of the given fraction by a number that will give the desired denominator; then multiply the numerator of the fraction by the same multiplier.

EXAMPLE: You want to find out how many eighths there are in ½

$\frac{1}{2} \times \frac{\_}{4} = \frac{?}{8}$ Multiply the denominator by 4 to give you the eighths denominator.

$\frac{1}{2} = \frac{?}{8}$ $\qquad$ $\frac{1 \times 4}{2 \times 4} = \frac{4}{8}$ $\qquad$ $\frac{1}{2} = \frac{4}{8}$

To change a fraction to its equivalent with a lower denominator, divide both the denominator and the numerator by the same number.

EXAMPLE: You want to find out how many fourths there are in $^{12}/_{16}$

$\frac{12}{16} = \frac{?}{4}$ $\qquad$ $\frac{12 \div 4}{16 \div 4} = \frac{3}{4}$ $\qquad$ $\frac{12}{16} = \frac{3}{4}$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Convert each of the fractions below to equivalent fractions for the denominator given.

1. $\frac{1}{2} = \frac{\_}{8}$
2. $\frac{1}{4} = \frac{\_\_\_}{32}$
3. $\frac{12}{16} = \frac{\_}{4}$
4. $\frac{10}{32} = \frac{\_\_\_}{16}$
5. $\frac{6}{8} = \frac{\_}{4}$
6. $\frac{5}{8} = \frac{\_\_\_}{32}$
7. $\frac{9}{16} = \frac{\_\_\_}{32}$
8. $\frac{18}{32} = \frac{\_\_\_}{16}$
9. $\frac{3}{4} = \frac{\_}{8}$
10. $\frac{7}{8} = \frac{\_\_\_}{32}$
11. $\frac{24}{32} = \frac{\_}{4}$
12. $\frac{28}{64} = \frac{\_\_\_}{16}$

Part 2

Multiply the denominators in the following sets of fractions to convert them to like fractions.

1. $\frac{3}{8}$ and $\frac{1}{2}$ = __________ and __________

2. $\frac{3}{4}$ and $\frac{9}{32}$ = __________ and __________

3. $\frac{1}{16}$ and $\frac{5}{8}$ = __________ and __________

4. $\frac{1}{2}$ and $\frac{7}{16}$ = __________ and __________

5. $\frac{3}{4}$ and $\frac{9}{16}$ and $\frac{7}{32}$ = __________ and __________ and __________

Part 3

Change the following sets of fractions to like fractions with the *lowest* common denominators.

1. $\frac{3}{10}$ and $\frac{1}{4}$ = __________ and __________

2. $\frac{2}{3}$ and $\frac{3}{16}$ = __________ and __________

3. $\frac{3}{4}$ and $\frac{9}{32}$ = __________ and __________

4. $\frac{1}{2}$ and $\frac{7}{16}$ = __________ and __________

5. $\frac{3}{4}$ and $\frac{5}{8}$ and $\frac{7}{10}$ = __________ and __________ and __________

ASSIGNMENT SHEET 8

FUNDAMENTAL MATH

4

Name ____Score_________

OBJECTIVE 39

Convert improper fractions to mixed numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

A fraction such as ¾ is called a proper fraction because its numerator (top number) is smaller than its denominator (bottom number). Some examples of proper fractions are ⅔, ⅕, and ⅞.

When the numerator of a fraction is the same, or larger, than the denominator, the fraction is called an improper fraction. Some examples of improper fractions are $\frac{4}{4}$, $\frac{5}{3}$, $\frac{9}{4}$, and $\frac{10}{8}$.

Numbers such as 2½, 5¾, and 6⅖ are called mixed numbers. They are made up of a whole number and a proper fraction.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Distinguish among the following fractions by writing a “P” in the blanks before a proper fraction, an “I” before an improper fraction, and an “M” in the blanks before a mixed number.

______ 1. ½

______ 2. 3⅞

______ 3. $\frac{16}{2}$

______ 4. 3⅛

______ 5. ¼

______ 6. $\frac{1}{1}$

______ 7. $\frac{7}{2}$

______ 8. 8½

______ 9. $\frac{4}{4}$

______ 10. 9$\frac{3}{16}$

______ 11. 5½

______ 12. $\frac{9}{8}$

______ 13. $\frac{9}{4}$

______ 14. ⅛

______ 15. 16¾

Part 2

A. Convert each of the following mixed numbers to improper fractions. Reduce to lowest terms when possible.

1. $3\frac{1}{4}$ = ________________
2. $4\frac{1}{2}$ = ________________
3. $7\frac{3}{4}$ = ________________
4. $8\frac{1}{2}$ = ________________
5. $6\frac{1}{8}$ = ________________
6. $5\frac{2}{4}$ = ________________
7. $4\frac{1}{4}$ = ________________
8. $8\frac{1}{2}$ = ________________
9. $9\frac{1}{4}$ = ________________
10. $16\frac{1}{2}$ = ________________

B. Convert each of the following improper fractions to mixed numbers. Reduce to lowest terms when possible.

1. $\frac{7}{4}$ = ________________
2. $\frac{9}{2}$ = ________________
3. $\frac{6}{4}$ = ________________
4. $\frac{15}{8}$ = ________________
5. $\frac{19}{16}$ = ________________
6. $\frac{11}{8}$ = ________________
7. $\frac{75}{32}$ = ________________
8. $\frac{5}{2}$ = ________________
9. $\frac{15}{4}$ = ________________
10. $\frac{33}{16}$ = ________________

ASSIGNMENT SHEET 9

FUNDAMENTAL MATH

4

Name ______________________________ Score ________

OBJECTIVE 40

Add fractions.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

INTRODUCTION

One of the most common calculations performed by a cement mason is the addition of fractions. For example, boards are seldom cut to lengths of even feet or inches. Often the length of a cut can only be determined by adding several dimensions, any of which may include a fraction. For accurate construction, the length must be figured correctly.

To add common fractions, change to equivalent fractions with the lowest common denominators. Add the new numerators and place this sum over the lowest common denominator. If the result is an improper fraction, change it to a mixed number and reduce to lowest terms.

EXAMPLE: $\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\,\frac{5}{12}$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Find common denominators and add the following fractions. Reduce to lowest terms.

1. $\frac{1}{4} + \frac{2}{8} =$ __________

2. $\frac{4}{16} + \frac{3}{4} =$ __________

3. $\frac{3}{4} + \frac{5}{32} =$ __________

4. $\frac{7}{8} + \frac{5}{16} =$ __________

5. $\frac{5}{8} + \frac{3}{32} =$ __________

6. $\frac{9}{16} + \frac{5}{8} =$ __________

7. $\frac{9}{16} + \frac{3}{4} =$ __________

8. $\frac{4}{4} + \frac{25}{32} =$ __________

9. An adhesive for repairing concrete requires mixing a part A to a part B. How many gallons of adhesive will be produced if you mix 1 pint of part A with 2 quarts of part B?

   ✔ **NOTE:** There are 8 pints in a gallon. There are 4 quarts in a gallon.

   Gallons of adhesive = ______________________

10. A courtyard on the second floor of a building is being renovated for new tenants. A waterproofing base is applied at an average of 3⁄16 of an inch and a decorative overlay is placed over the top at the average depth of 3⁄8 of an inch. What is the average increased depth of the slab?

    Average increased depth = ______________________

11. A building has three floors that need underlayment at an average depth of ¼ inch. A four-bag unit will cover 100 square feet at ¼ inch depth. There are 7 bags left over from the first floor and 4 bags left over from the second floor. How many units are left for the third floor? How many square feet will these bags cover?

    Square feet = ______________________

12. How far below the floor drain should the finisher float the concrete if allowing for ¼ inch of grout and 7⁄16 inch of tile?

    Height below floor drain = ______________________

ASSIGNMENT SHEET 10

Name ______________________________ Score ________

OBJECTIVE 41

Subtract fractions.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Just as cement masons must frequently add fractions, they must also subtract fractions. Although the dimensions on the blueprint may look nice and even, the actual construction leads to many fractional measurements.

To subtract common fractions, change to equivalent fractions with common denominators. Find the difference between the numerators of the equivalent fractions. Place the difference over the common denominator and, if necessary, reduce the answer to the lowest terms.

EXAMPLE: $\frac{2}{3} - \frac{1}{4}$ becomes $\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Subtract each of the common fractions given below. Reduce to the lowest terms.

1. $\frac{3}{4} - \frac{3}{16} =$ __________
2. $\frac{7}{8} - \frac{1}{4} =$ __________
3. $\frac{30}{32} - \frac{3}{4} =$ __________
4. $\frac{25}{32} - \frac{5}{8} =$ __________
5. $\frac{7}{8} - \frac{2}{16} =$ __________
6. $\frac{15}{16} - \frac{3}{8} =$ __________
7. $\frac{1}{2} - \frac{7}{16} =$ __________
8. $\frac{3}{4} - \frac{3}{8} =$ __________
9. $\frac{13}{16} - \frac{9}{32} =$ __________
10. $\frac{7}{8} - \frac{6}{16} =$ __________

11. The actual dimensions of a two-by-four board are 1½" x 3½". How much difference is there between the stated width and actual width of a two-by-four board?

    Difference in width = ______________________

12. The directions for installing anchor bolts state that the cement mason must first drill a hole 1/32 inch smaller than the diameter of the anchor bolt. What diameter hole must be drilled if a cement mason uses anchor bolts with a 9/16-inch diameter?

    Hole diameter = ______________________

13. What is the difference in thickness between ½-inch plywood and ⅝-inch plywood?

    Difference in thickness = ______________________

14. A saw blade removed 1/64 inch of wood for each cut. A board 47⅝ inches long is cut in two. If one piece is 24½ inches long, how long is the other piece?

    Length = ______________________

15. A 12-penny nail is 3¼ inches long, not counting the head. If a two-by-four is actually 1½-inch thick, how much of the nail will extend beyond the board if you drive a 12-penny nail through a two-by-four board?

    Length of extended part of nail = ______________________

ASSIGNMENT SHEET 11

FUNDAMENTAL MATH

4

Name ______________________________________ Score_________

OBJECTIVE 42

Multiply fractions.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Multiplying with fractions is often a shortcut for adding fractions; and because cement masons often add similar fractions, they can multiply to save time. A good cement mason quickly learns to appreciate the convenience of being able to multiply fractions when possible.

To multiply fractions, multiply the numerators and denominators separately. Write the product of the numerator over the product of the denominator and reduce to the lowest terms.

EXAMPLE: $\frac{2}{3} \text{ x } \frac{3}{4}$ becomes $\frac{2 \text{ x } 3}{3 \text{ x } 4} = \frac{6}{12} = \frac{1}{2}$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Multiply the following fractions. Convert mixed fractions where needed and reduce answers to the lowest terms.

1. $\frac{1}{2} \text{ x } \frac{3}{4} =$ __________

2. $1\frac{1}{2} \text{ x } 2\frac{1}{4} =$ __________

3. $\frac{7}{8} \text{ x } \frac{2}{3} =$ __________

4. $\frac{1}{4} \text{ x } \frac{1}{3} \text{ x } \frac{1}{2} =$ __________

5. $\frac{3}{8} \text{ x } \frac{5}{16} =$ __________

6. $\frac{1}{2} \text{ x } 6\frac{1}{2} =$ __________

7. $1\frac{1}{3} \text{ x } 2\frac{1}{4} \text{ x } \frac{1}{2} =$ __________

8. $2\frac{3}{4} \text{ x } 6\frac{1}{8} =$ __________

9. A sports court slab has a fall of ¼ inch for each foot. How many inches of fall does it have over the total width of 40 feet?

   Inches of fall = ______________________

10. A certain adhesive requires mixing ¾ gallon base and ¼ gallon hardener to make a gallon of adhesive. How much base should a worker use if she needs to mix only ⅓ gallon of adhesive?

    Amount of base = ______________________

11. There are 296 four-penny nails per pound. How many nails are there in ¼ pound?

    Number of nails = ______________________

12. After completing a color overlay job, a contractor has 8 and ⅔ bottles left of three different colors. If ½ of the color is brown, how many bottles of brown are there?

    Bottles of brown = ______________________

ASSIGNMENT SHEET 12

FUNDAMENTAL MATH

4

Name ____Score__________

OBJECTIVE 43

Add decimal numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

As a consumer of raw materials, a cement mason often needs to calculate the costs of building a structure. Such costs are figured in dollars and cents. But cents are only decimal parts of a dollar, and every time cement masons or anyone else totals the cost of a purchase, they are adding decimals.

You can add decimals just as you add whole numbers. You must be careful, though, to keep all decimal points aligned.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Add each column of numbers, carrying when necessary. Place a decimal point in the answer directly under the decimal points above.

EXAMPLE:

$$\begin{array}{r} 0.26 \\ +\ 0.168 \\ \hline 0.428 \end{array} \qquad \begin{array}{r} \$4.60 \\ +\ \ .40 \\ \hline \$5.00 \end{array}$$

1. $\begin{array}{r} 0.024 \\ +\ 0.165 \\ \hline \end{array}$

2. $\begin{array}{r} 0.873 \\ +\ 0.199 \\ \hline \end{array}$

3. $\begin{array}{r} \$4.60 \\ +\ 4.62 \\ \hline \end{array}$

4. $\begin{array}{r} 0.0003 \\ +\ 0.0099 \\ \hline \end{array}$

5. $\begin{array}{r} \$62.14 \\ +\ 8.87 \\ \hline \end{array}$

6. $\begin{array}{r} \$34.87 \\ +\ 96.45 \\ \hline \end{array}$

7. $\begin{array}{r} 195.7 \\ 83. \\ +\ 9.006 \\ \hline \end{array}$

8. $\begin{array}{r} 0.0131 \\ 0.1640 \\ +\ 0.2229 \\ \hline \end{array}$

9. $\begin{array}{r} 4.612 \\ 0.958 \\ +\ 0.885 \\ \hline \end{array}$

10. 4937.23
4980.47
10234.97
+ 9872.21

11. 15.125
4.625
20.125
+ 16.125

12. 0.52802
0.34007
0.00321
+ 0.00009

13. A concrete contractor bought some patching materials and spent $141.72 for non-shrink grout, $16.81 for buckets, and $6.27 for a margin trowel. What was the total cost of the patching material?

Total cost = ______________________

14. A cement mason worked four days for a general contractor. She worked 6.5 hours Monday, 7.5 hours Tuesday, 9.0 hours Wednesday, and 4.5 hours Thursday. How many hours did she work for the contractor?

Total hours worked = ______________________

15. How much was spent on tools if a cement mason bought the tools below at the prices listed?

Circular Saw	$95.88
Hand Saw	$9.95
Sledge Hammer	$22.99
Claw Hammer	$28.90

Total amount spent = ______________________

ASSIGNMENT SHEET 13

FUNDAMENTAL MATH

4

Name ____ Score__________

OBJECTIVE 44

Subtract decimal numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Decimals are a part of our daily lives, not only in figuring money but also in calculating time, distance, area, and many other quantities. In the cement mason trade, decimals are becoming more common, especially with the increased use of metric measurements. Subtraction is one of the basic mathematical operations performed with decimals in the trade.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Set up each of the following problems in column form. Subtract and check your work. Remember when you subtract decimals, the decimal points must be aligned.

1. 868.87 - 516.89 = ___________

2. 567 - 19.856 = ___________

3. 198 - 56.987 = ___________

4. 567.94 - 59.78 = ____________

5. $815.23 - $65.98 = ____________

6. $20.03 - $15.88 = ____________

7. 694.7 - 24.3 = ____________

8. 5,000 - 892.66 = ____________

9. $15 - $12.53 = ____________

10. $219.30 - $21.85 = ____________

11. A cement mason keeps track of mileage driven on the job. At the beginning of the month the vehicle odometer reads 29,268.4. At the end of the month the odometer reads 29,872.1. How many miles were driven during the month?

    Miles driven for month = _______________________

12. A concrete contractor completed a project and computed his profit. He was paid $6500 for the project. How much profit did he make if his expenses were $4,718.96?

    Profit = ______________________

13. A cement mason bought lumber on sale. He had estimated the cost to be $1238.62 based on the regular price. How much did he save if the cost on sale was $1061.19?

    Savings = ______________________

14. A floor plan has 1,781 square feet of living space. A change is made to the plan, reducing the living space by 264.5 square feet. What is the area of the modified plan?

    Area of modified plan = ______________________

ASSIGNMENT SHEET 14

FUNDAMENTAL MATH

4

Name ______________________________________Score_________

OBJECTIVE 45

Multiply decimal numbers.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

Cement masons work with many geometric shapes and are often required to calculate the area of such shapes. The formulas used in computing the areas of shapes often require multiplying by decimals, such as in using 3.14 to figure the area of a circle. Additionally, costs and earnings may be calculated by multiplying with decimals — an essential skill for any good cement mason.

Multiplication with decimals is similar to multiplication with whole numbers. However, with decimals you must take care in placing the decimal point correctly. The number of decimal places in an answer must equal the total number of decimal places in the numbers that you multiplied.

EXAMPLE:

16.11	2 Decimal Places
x 2.2	1 Decimal Place
3222	
3222	
35.442	3 Decimal Places in Answer

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Set up each of the following problems in column form and multiply. Locate the decimal point in the answer.

1. 2.64 x 3.1 = ___________

2. 120 x 0.33 = ____________

3. 2.25 x 0.51 = ____________

4. 35 x 8.5 = ____________

5. 26.4 x 3.8 = ____________

6. 7.02 x 0.92 = ____________

7. 0.83 x 0.55 = ____________

8. 28.2 x 0.9 = ____________

9. 0.069 x 0.01 = ____________

10. 7.52 x 3.01 = ____________

11. A power trowel is placed on sale for 25 percent off. How much is the price reduced if the regular price is $1349.80?

✔ **NOTE:** Twenty-five percent is the same as the decimal 0.25.

Price reduction = ______________________

12. The average cost per square foot of houses in a certain area is $41.25. What would be the approximate cost of a 1500-square-foot house?

Approximate cost = ______________________

13. A cement mason buys 38 pairs of knee pads at $1.99 a pair. What is the total cost?

Total cost = ______________________

ASSIGNMENT SHEET 15

FUNDAMENTAL MATH

4

Name ____Score_________

OBJECTIVE 46

Divide decimal numbers.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

INTRODUCTION

A cement mason will usually have to shop around to find the best buys in tools and materials. Price comparisons often become difficult because not all suppliers base their prices on the same unit. For example, one supplier may price form plywood by the sheet while another quotes costs by the square foot. Being able to divide decimal numbers will help a cement mason determine the best buys. Division with decimal numbers is also useful in figuring quantities of materials, weighing job opportunities, and in many other aspects of the trade.

Division with decimals is like division with whole numbers. However, before you begin to divide, you must decide where the decimal point should be placed in the number.

First study the divisor. If it has a decimal, move the decimal point to the right so that you can change the decimal to a whole number. Then move the decimal point the same number of places to the right in the original number (number into which you are dividing).

EXAMPLE 1: Decimal point moved one place in both numbers.

EXAMPLE 2: Decimal point moved two places in both numbers.

EXAMPLE 3: Decimal point moved one place in both numbers; note that a zero had to be added.

$$1.\underset{\curvearrowright}{3.}\overline{)26.\underset{\curvearrowright}{0}\dot{.}} \qquad\qquad \begin{array}{r} 20. \\ 13.\overline{)260.} \\ \underline{26} \\ 00 \end{array}$$

EXAMPLE 4: No decimal point was moved to the right because 3 is already a whole number.

$$3\overline{).6} \qquad\qquad \begin{array}{r} .2 \\ 3\overline{).6} \\ \underline{6} \\ 0 \end{array}$$

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Divide numbers in the following problems. Show your work.

1. 4.5 ÷ 0.5 = ___________

2. 4.96 ÷ 0.4 = ___________

3. 19.8 ÷ 0.6 = ___________

4. 10.71 ÷ 0.07 = ___________

5. 0.225 ÷ 0.15 = ___________

6. 1.7608 ÷ 0.0062 = ____________

7. 0.48 ÷ 0.6 = ____________

8. 0.125 ÷ 0.25 = ____________

9. 0.9 ÷ 0.003 = ____________

10. 1.16 ÷ 2.9 = ____________

11. What is the approximate cost per sheet of form plywood if the cost of twelve sheets is $103.68?

    Approximate cost = ______________________

12. How many hours did a cement mason work if she was paid a total of $681.75 at the rate of $22.50 per hour?

    Total hours = ______________________

13. How many lots can be platted on a 21.12-acre addition if the average lot is .66 acres?

Number of lots = ______________________

14. A cement mason spent $172.80 for trowels. What was the cost per trowel if he bought eight trowels?

Cost per trowel = ______________________

ASSIGNMENT SHEET 16

FUNDAMENTAL MATH

4

Name ____Score_________

OBJECTIVE 47

Convert common fractions to decimal numbers and percentages.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

In cement masonry converting percentages is often useful. Percent means per hundredths. Five percent means five one-hundredths and may be written three ways: $\frac{5}{100}$, 0.05, and 5%. All have the *same* mathematical value.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Complete the following exercises.

A. Express each of the following fractions as a decimal.

1. $\frac{1}{8}$ = ____________
2. $\frac{1}{4}$ = ____________
3. $\frac{1}{2}$ = ____________
4. $\frac{3}{4}$ = ____________
5. $\frac{5}{8}$ = ____________
6. $\frac{1}{16}$ = ____________
7. $\frac{3}{32}$ = ____________
8. $\frac{7}{8}$ = ____________
9. $\frac{9}{16}$ = ____________
10. $\frac{15}{16}$ = ____________

B. Express each of the following fractions as a percentage.

1. ¼ = ____________
2. ½ = ____________
3. 7⁄10 = ____________
4. ¾ = ____________
5. 2⁄2 = ____________
6. 1⁄10 = ____________
7. ⅞ = ____________
8. 5⁄10 = ____________
9. ⅓ = ____________
10. ⅝ = ____________

Part 2

Fractions having denominators of ten, or one of the powers of ten (place values), are easily written as decimal numbers. Simply allow as many places to the right of the decimal point as there are zeros in the denominator.

EXAMPLES:
1 5⁄10 = 1.5 tenths
1 25⁄100 = 1.25 hundredths
1 125⁄1000 = 1.125 thousandths

A. Match the decimal numbers on the right to their correct equivalent fractions. Write the correct letters in the blanks.

____ 1. 5 6⁄10
____ 2. 1 2⁄100
____ 3. 87⁄1000
____ 4. 7 83⁄1000
____ 5. 5 6⁄100
____ 6. 5 6⁄1000
____ 7. 78 3⁄10
____ 8. 87 7⁄10
____ 9. 102
____ 10. 783⁄1000

a. 7.083
b. 5.006
c. 78.3
d. 0.087
e. 0.783
f. 87.7
g.

B. Write decimal equivalents for each of the following fractions.

1. $63\frac{9}{10}$ = ____________
2. $5\frac{93}{100}$ = ____________
3. $5\frac{93}{1000}$ = ____________
4. $5\frac{93}{10000}$ = ____________
5. $3\frac{825}{1000}$ = ____________
6. $38\frac{95}{100}$ = ____________
7. $38\frac{95}{1000}$ = ____________
8. $42\frac{3}{10}$ = ____________
9. $402\frac{3}{10}$ = ____________
10. $897\frac{97}{100000}$ = ____________

Part 3

A. Express each of the following percentages as a fraction. Reduce to the lowest terms.

1. 50% = ____________
2. 25% = ____________
3. $33\frac{1}{3}\%$ = ____________
4. 36% = ____________
5. 28% = ____________
6. $14\frac{2}{7}\%$ = ____________
7. 21% = ____________
8. 75% = ____________
9. $66\frac{2}{3}\%$ = ____________
10. 70% = ____________

B. Express each of the following percentages as a decimal.

1. 47% = ____________
2. 15% = ____________
3. 33.3% = ____________

4. 62% = ____________

5. 75% = ____________

6. 3% = ____________

7. 16.8% = ____________

8. 9% = ____________

9. 10% = ____________

10. 50% = ____________

ASSIGNMENT SHEET 17

FUNDAMENTAL MATH

Name ____Score__________

OBJECTIVE 48

Solve percentage problems.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

In the cement masonry field, you will frequently come across percentages. Interest rates, pricing discounts, waste allowances, the rise or decline of housing starts, and many other factors that affect the industry are stated as percentages. To make the most of your career in this field, you must understand what percentages mean and how they are used.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Part 1

Solve the following percentage problems.

1. What does it mean to say 100 percent of the work is completed?

2. There are usually 100 tools in the tool shed. Fourteen of them are missing. What percent of the tools are missing?

   ____

3. If 14 of the tools are missing in the above problem, how many are present?

   ____

4. There are 100 2x4's in a stack. Twenty-five 2x4's are what percent of the stack? Five 2x4's are what percent of the stack?

5. There are 100 jobs on the agenda. Ninety-four have been completed. What percent of the jobs have been completed?

6. If 94 of the jobs in the above problem have been completed, how many have not?

7. If 11 percent of the students in a school are absent, what percent are present?

8. If 6 percent of the handsaws that a store had in stock were not sold, what percent were sold?

9. If 60 percent of the cement masons in town had cards, what percent did not have cards?

10. Bill has a bucket of concrete tools. Ten percent of his tools are a year old, and 40 percent are over a year old. What percent are less than a year old?

11. Susan has three types of screwdrivers — flat, Phillips, and square. Eighty percent of her screwdrivers are flat, and 15 percent are square. What percent are Phillips?

12. The Smiths spent 22 percent of their income for their business, 17 percent for tools, 15 percent for work clothes, and 8 percent for entertainment. What percentage was left for other things?

13. Chester has finished 75 percent of the job he is doing. What percent does he still have to do?

14. Betty has completed 40 percent of her training. What percent does she still have to do?

15. If you were told to complete 93 percent of the work, what percent would be left?

Part 2

Solve the following percentage problems.

1. 3% of 72 is what number? ____________
2. 5% of 18 is what number? ____________
3. What number is 33⅓% of 96? ____________
4. 40% of 125 is what number? ____________
5. 68% of 63.5 is what number? ____________
6. What number is 12½% of 140.8? ____________
7. What number is 1% of 103? ____________
8. What number is 37½% of 152? ____________
9. 50% of 32.8 is what number? ____________
10. 7% of 163 is what number? ____________

Part 3

Solve the following percentage problems. Show your work.

1. There are 20 students in a class. Sixty percent of the students are boys. How many are boys?

2. One day 5 percent of the 20 cement masons in Mr. Moore’s group made perfect time completing a job. How many cement masons made perfect time?

3. Contractor McGill bought a new concrete saw, regularly selling for $1000, at a sale and saved 20 percent. How much did he save?

4. The number of cement masons at the meeting this week was 75 percent of what it was last week. Last week there were 800 cement masons at the meeting. How many cement masons were at the meeting this week?

ASSIGNMENT SHEET 18

FUNDAMENTAL MATH

4

Name ______________________________________Score________

OBJECTIVE 49

Calculate the area of geometric figures.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

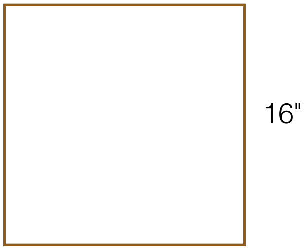
Calculate area for the following problems.

1. Calculate the area for each of the following squares.

a.

A = ____________

b.



A = ____________

c. Square = 15 feet

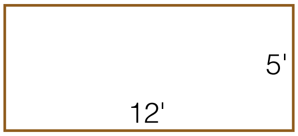
A = ____________

d. Square = 36 yards

A = ____________

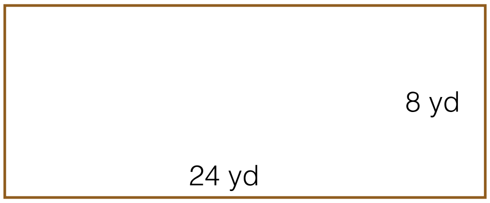
2. Calculate the area for each of the following rectangles.

a.



A = ____________

b.



A = ____________

c. L = 17"; W = 31"

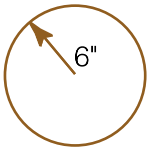
A = ____________

d. L = 62'; W = 16'

A = ____________

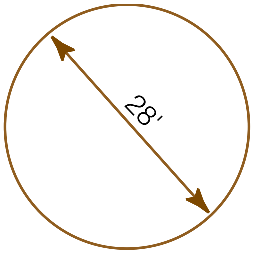
3. Calculate the area for each of the following circles. (Use $\prod$ = 3.14.)

a.



A = ____________

b.



A = ____________

c. Radius = 16'

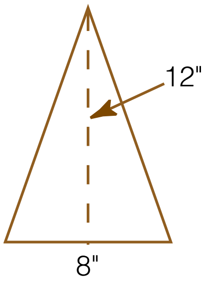
A = ____________

d. Diameter = 25 yards

A = ____________

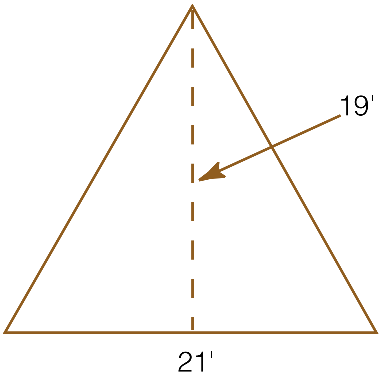
4. Calculate the area for each of the following triangles.

a.



A = ____________

b.



A = ____________

c. b = 13"; h = 3"

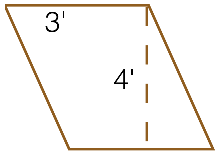
A = ____________

d. b = 24 yards; h = 15 yards

A = ____________

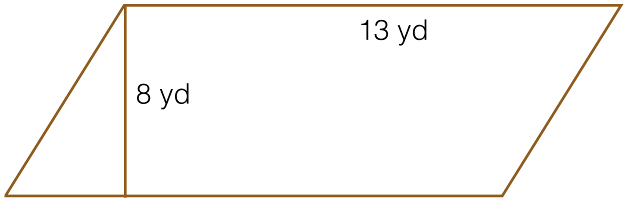
5. Calculate the area for each of the following parallelograms.

a.



A = ____________

b.



A = ____________

c. b = 16"; h = 16"

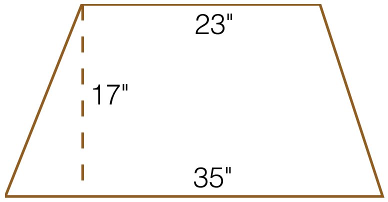
A = ____________

d. b = 27 yards; h = 9 yards

A = ____________

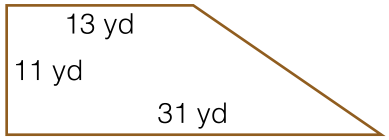
6. Calculate the area for each of the following trapezoids.

a.



A = ____________

b.



A = ____________

c. h = 12'; b_1 = 9'; b_2 = 19'

A = ____________

d. h = 17 yards; b_1 = 39 yards; b_2 = 51 yards

A = ____________

ASSIGNMENT SHEET 19

FUNDAMENTAL MATH

4

Name ____ Score __________

OBJECTIVE 50

Calculate volume of solid figures.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

INTRODUCTION

Cement masons should be familiar with volumetric measurements in order to make estimates and to use materials wisely. One of the most common uses of cubic volume measurements is in estimating concrete. A good cement mason must be familiar with how to estimate concrete.

EQUIPMENT AND SUPPLIES

- Pen or pencil

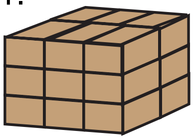
INSTRUCTIONS

Part 1

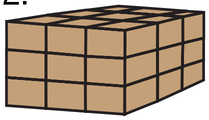
Record the dimensions and volume for the figures below this chart. Remember that volume is the number of cubic units.

	Height = H	Width = W	Length = L	Volume = V
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

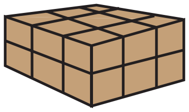
1.



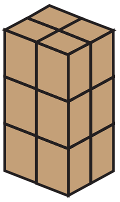
2.



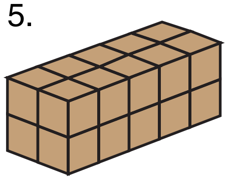
3.



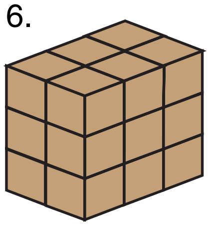
4.



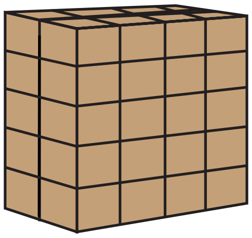
5.



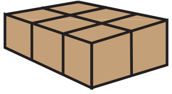
6.



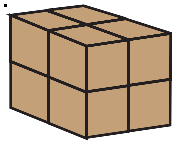
7.



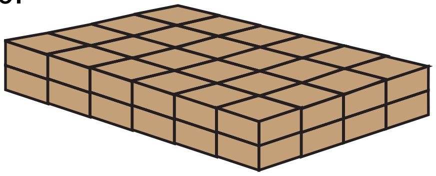
8.



9.



10.



Part 2

Answer the following questions about the boxes illustrated below and on the following pages.

____________________ 1. How many cubes are there in Box #1?

____________________ 2. How many cubes are still needed to fill the bottom layer of Box #1?

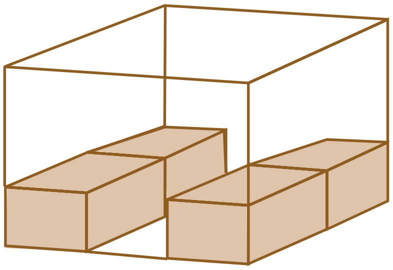
____________________ 3. How many layers can Box #1 hold inside?

____________________ 4. How many cubes are needed for the top layer in Box #1?

____________________ 5. How many total cubes would there be if Box #1 was full?

____________________ 6. What is the volume of Box #1?

Box #1

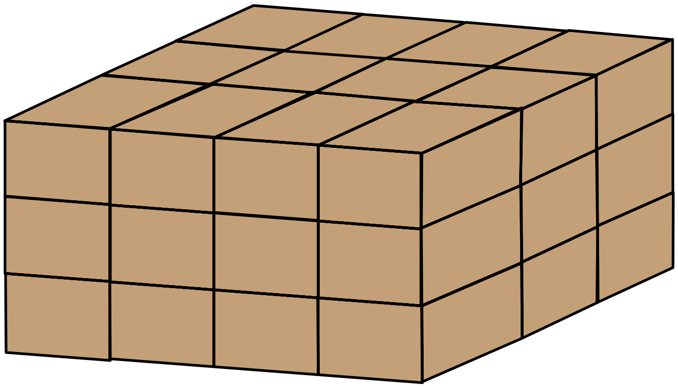


____________________ 7. How many cubes are there in the bottom layer of Box #2?

____________________ 8. How many layers are there in Box #2?

____________________ 9. What way can volume be figured for Box #2 *without counting* each of the cubes?

Box #2



____________________ 10. How many cubic inches in 1 cubic foot? (Think of stacking cubic inches in Box #3.)

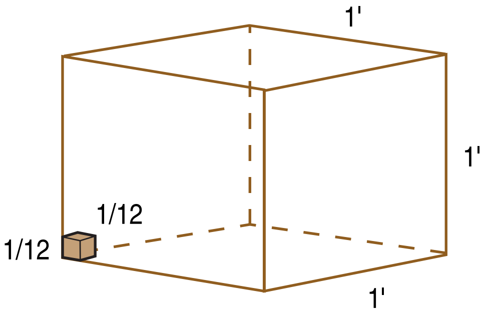
____________________ 11. How many cubic inches would it take to fill one layer in Box #3?

____________________ 12. How many cubic inches would it take to fill two layers in Box #3?

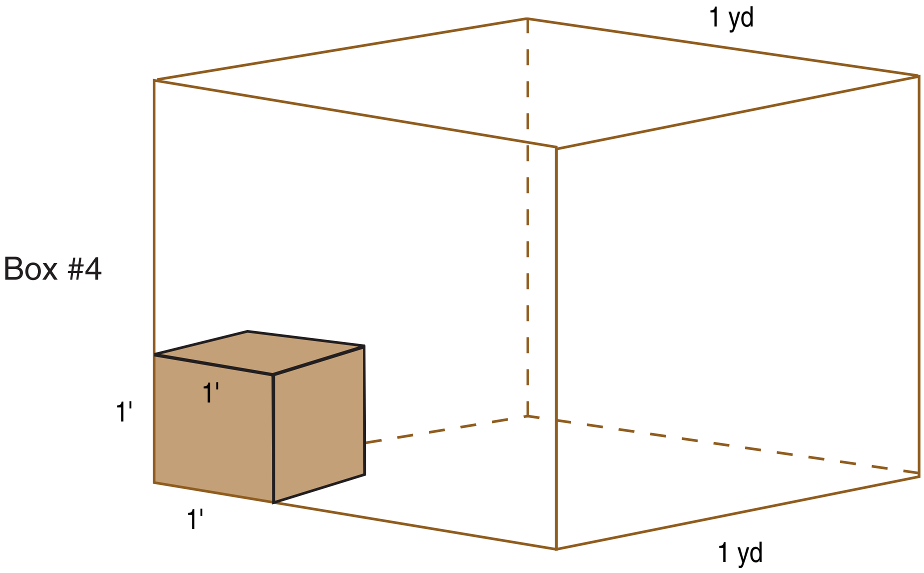
____________________ 13. How many cubic inches would it take to fill three layers in Box #3?

____________________ 14. How many layers would it take to fill Box #3?

Box #3



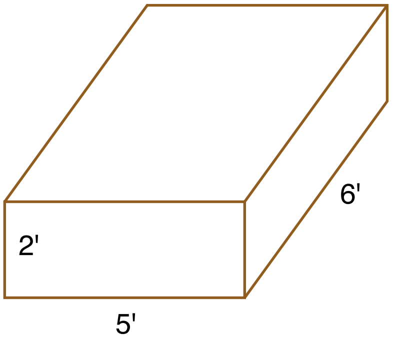
______________________ 15. How many cubic feet are in 1 cubic yard? (Think of stacking cubic feet in Box #4.)



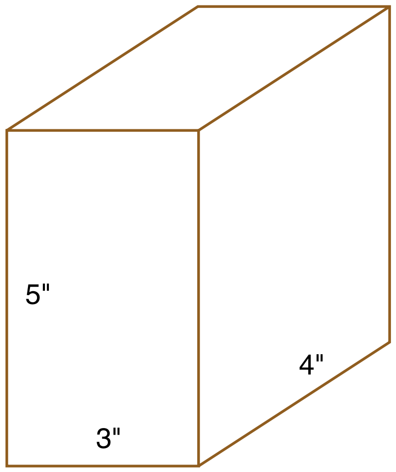
Part 3

Use the formula V = LWH to calculate volume for the following figures.

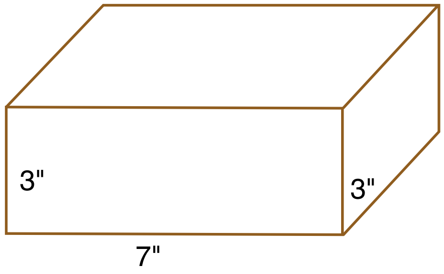
1. V = _________________________



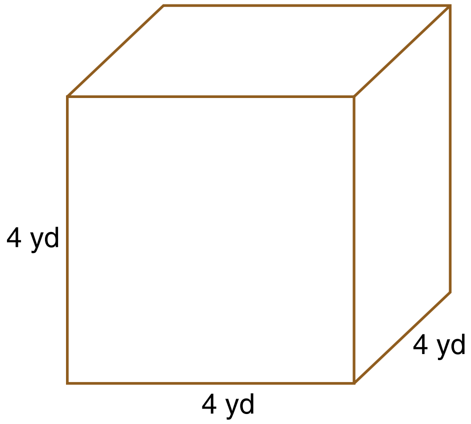
2. V = ______________________________



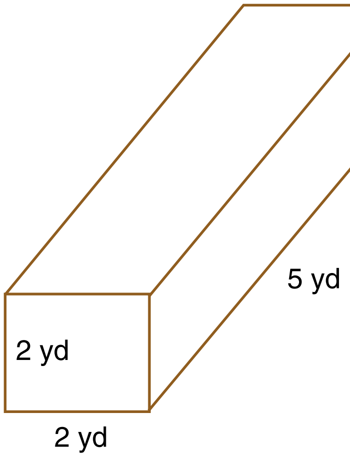
3. V = ______________________________



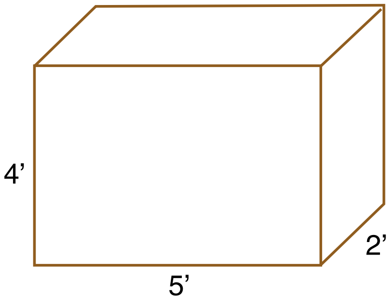
4. V = ______________________________



5. V = ______________________________



6. V = ______________________________



ASSIGNMENT SHEET 20

FUNDAMENTAL MATH

4

Name ____ Score__________

OBJECTIVE 51

Estimate cubic yards.

BASIC SKILLS

Reading

Mathematics

Critical Thinking

Employability

INTRODUCTION

Cement masons often have to compute cubic yard measurements to estimate materials and labor. Cubic yards is the basic unit of measurement for excavation and fill dirt, for concrete, for mortars and grouts, and for other materials. Therefore, a cement mason must be able to calculate cubic yard measurements accurately.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Solve the following problems involving cubic yards.

1. How many cubic yards of concrete will it take for a driveway 20 feet wide by 72 feet long by 4 inches thick?

   Total cubic yards = ______________________

2. Find the total cubic yards of gravel it will take to fill a hole if the hole is 8 feet wide, 22 feet long, and 6 inches deep?

   Total cubic yards = ______________________

3. How many cubic yards of grout will it take to fill a cavity 12 feet high, 37 feet long, and 3 inches thick?

   Total cubic yards = ______________________

4. Find the total cubic yards of sand it will take to fill a swimming pool 34 feet wide, 45 feet long, and 4 inches thick?

   Total cubic yards = ______________________

5. How many cubic yards of concrete will it take to pour a sidewalk 6 feet wide, 118 feet long, and 4 inches thick?

   Total cubic yards = ______________________

ASSIGNMENT SHEET 21

FUNDAMENTAL MATH

4

Name ____ Score__________

OBJECTIVE 52

Solve basic ratio and proportion problems.

BASIC SKILLS

Reading Mathematics Critical Thinking Employability

INTRODUCTION

The cement masonry trade uses more ratios and proportions today than ever before. New epoxies and adhesives often require mixing. Additionally, mortars and other materials require mixing. Ratios are used to designate grade slopes. The cement mason will be required to calculate some ratios and proportions, and will be required to apply many others.

EQUIPMENT AND SUPPLIES

- Pen or pencil

INSTRUCTIONS

Solve the following ratio and proportion problems. Show your work.

1. Convert the ratio 0.25:0.25:1 to the smallest proportion possible containing whole numbers.

   Proportion = ______________________

2. What would be the proportion if a 1:2:12 mix was cut in half?

   Proportion = ______________________

3. What would be the proportion if the ratio 1:1:3 was tripled?

   Proportion = ______________________

4. You are asked to mix a batch of mortar using a 1:1:6 ratio, but you will need six times this amount. What will be the proportion of materials needed?

   Proportion = ______________________

5. A mixture of 1 part cement, 1 part gravel, and 3 parts sand is needed to make 25 cubic feet of concrete. How many cubic feet of each are needed?

   Cubic feet cement = ______________________

   Cubic feet gravel = ______________________

   Cubic feet sand = ______________________